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ABSTRACT

This module is oriented toward information students in grades 9-12 about the impact of environmental hazards on human health, and to motivate them to take personal responsibility for their part in protecting the environment. Instructionally, the module utilizes a small group cooperative learning strategy, and is organized into nine lessons. Part 1 (lessons 1-4) introduces the unit and sets up long-term assignments and experiments that will be reported on at the end of the unit. It also contains two lessons, one about toxic chemicals, and one about recycling, that do not involve team presentations. Part 2 (lessons 5-7) focuses specifically on environmental issues of land, air, and water, how they affect human health and what it takes to be responsible environmental citizens. In these lessons student teams make presentations to the class on their areas of expertise. Part 3 (lessons 8-9) provides the opportunity to integrate what has been learned in earlier lessons. Students present the results of their long-term assignments and experiments, and class members consider what they can do to preserve the environment. Included in the appendices are a glossary of special terms used in the module and a list of organizations to contact for further information about environmental issues. Worksheets and handouts for students are included. (LLL)

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ENTERING ADULTHOOD

ED329839

Creating a Healthy Environment

Donna Lloyd-Kolkin, PhD

CG023209

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CONTEMPORARY HEALTH SERIES

Kathleen Middleton, MS, Series Editor

2

ENTERING ADULTHOOD:

Creating a Healthy Environment

ENTERING ADULTHOOD:

Creating a Healthy Environment

A Curriculum for Grades 9-12

Donna Lloyd-Kolkin, PhD

Contemporary Health Series
Kathleen Middleton, MS, Series Editor

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DEDICATION

Dedicated to the ones I love—Albert, Lucia and Sarah.

—DLK

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EDITOR'S PREFACE
Contemporary Health Series

Health educators and practitioners know that prevention of health problems is far more desirable than treatment. The earlier the knowledge and skill to make healthful decisions are instilled, the greater the chance a healthful lifestyle will be adopted. School is the logical place in our society to provide children, adolescents and young adults the learning opportunities essential to developing the knowledge and skills to choose a healthful life course.

The **Contemporary Health Series** has been designed to provide educators with the curricular tools necessary to challenge students to take personal responsibility for their health. The long-range goals for the **Contemporary Health Series** are as follows:

Cognitive. Students will recognize the function of the existing body of knowledge pertaining to health and family life education.
Affective. Students will experience personal growth in the development of a positive self-concept and the ability to interact with others.
Practice. Students will gain skill in acting on personal decisions about health-related life choices.

Within the **Contemporary Health Series** there are two curricular divisions: Into Adolescence for middle school teachers and Entering Adulthood for high school teachers. The Into Adolescence modules focus on several different health and family life topics. Modules addressing puberty, AIDS, the family, self-esteem, reproduction and birth, sexual abstinence, and drug, alcohol and tobacco education have been developed by skilled author/educators.

Entering Adulthood includes reproduction, birth and contraception, health behavior, communication and self-esteem, AIDS and other STDs, relationships, sexual abstinence, and drug, alcohol and tobacco education.

All the authors are, or have been, classroom teachers with particular expertise in each of the topic areas. They bring a unique combination of theory, content and practice resulting in curricula which weave educational learning theory into lessons appropriate for the developmental age of the student. The module format was chosen to facilitate flexibility as the modules are compatible with each other but may stand alone. Finally, ease of use by the classroom teacher has driven the design. The lessons are comprehensive, key components are clearly identified and masters for all student and teacher materials are provided.

The **Contemporary Health Series** is intended to help teachers address critical health issues in their classrooms. The beneficiaries are their students, our children, and the next generation.

Kathleen Middleton, MS, CHES
Series Editor

ACKNOWLEDGMENTS

I would like to thank the many organizations concerned with environmental issues across the country who generously shared their resources in the development of this publication. They are so numerous that it would be impossible to list each of them here individually.

In particular, I would like to thank the Earth Day staff for allowing me access to their materials and for sharing their time and publications so generously. Much of the reading material in this module is adapted from fact sheets prepared by Earth Day staff.

In addition, I would like to thank the people who reviewed *Entering Adulthood: Creating a Healthy Environment* and made thoughtful and constructive comments for its revision.

INTRODUCTION

The 1990s have been called the decade of the environment. Our planet's environmental issues have become so pressing that they take center stage on the world's political and social agendas. Now as never before, it is time to change our society's attitude toward the earth's resources—from one of reckless exploitation for economic gain to one of nurturing and protective stewardship.

Teaching adolescents and young adults to value and protect the natural environment is an important step in accomplishing this goal. This curriculum focuses on the threats to personal and public health posed by environmental hazards. The overall intent is to motivate students to assume personal responsibility for protecting the environment.

So powerful is the relationship between the environment and health that the Environmental Protection Agency created the following statement at the beginning of the 1980s. It remains equally applicable a decade later.

The Environment and Health

Too often, when we hear the word *environment*, we think it's out *there*, that we are separate from it. In reality, however, we are associated with the environment in numerous complex ways. The human body is about 60 percent water, adults breathe a minimum of 12,000 quarts of air every 24 hours, and in many less obvious ways we are clearly creatures of this planet. As our physical and social environment changes, the physical and chemical make-up of our bodies is altered. As we consume air, water

and food, our bodies absorb and react to their contents. Noise and radiation also affect us. The breakdown of ecological systems mirrors our own destiny: as land, air, water and living creatures are affected by environmental mismanagement, our lives are diminished.

The most important objective of environmental protection is the prevention of disease and death....

Health effects related to the environment are not limited to such well-known and serious ailments as cancer, neurological danger or heart and lung diseases. Environmental pollution also diminishes well-being, lowers human vitality, contributes to lost work time and aggravates chronic illness.

...The prevention of environmentally related diseases is not free. But compared to the costs of the illnesses and deaths that protection efforts allow us to diminish or avoid, the price is surely small.

Environmental Protection Agency
1981

Entering Adulthood: Creating a Healthy Environment is oriented toward informing students about the global environmental crises we are facing as we head toward the year 2000, the implications for human health and what each of us can do to protect our planet.

Overview

This module has two goals. The first is to convey an understanding of the impact of environmental hazards on human health. The second is to motivate students to take personal responsibility for their part in protecting the environment in order to sustain life and improve human health.

The curriculum offers a broad survey approach to issues of environment and health, touching on many issues within the environmental components of air, land and water. The interrelationships among these components are stressed, e.g., how air pollution becomes acid rain, thereby impacting lakes, streams and forests in large areas of the earth.

The responsibility each person must accept for preserving the environment and the action steps each can take to make that happen are recurring themes.

Instructionally, the module utilizes a small group cooperative learning strategy across several lessons, as students are organized into Environmental Health Detective teams. These teams work together throughout the unit on both in-class activities and out-of-class assignments to solve the mystery of how to save the planet.

You are encouraged to establish "The Great Environmental Health Detective Competition" between the teams. This will add spice to the learning endeavor, motivate students to give their best efforts to the team assignments and make the process fun. However, this is not a requirement for using the module.

Teachers must adapt the processes presented in this curriculum to meet the specific needs of the learners. You are the best judge of what works with your students. Competition may or may not be appropriate.

The learning opportunities presented here encourage students to assume responsibility for acquiring and sharing knowledge about the environment with their classmates. This is done primarily in teams, as students develop expertise about a particular aspect of the environment and participate in class presentations.

These class presentations are actually opportunities for students to coteach the lessons with you. You are encouraged to spend some time with each team to help them plan a presentation, with student worksheets, that meets your instructional objectives.

If you do not have the time to make this happen, don't despair. Each lesson also provides background information, discussion questions and student worksheets for you to use in their entirety or to supplement the team presentations.

Organization of the Module

Entering Adulthood: Creating a Healthy Environment has nine lessons. While the average lesson spans one to two class periods, this will vary greatly depending on student presentations. The module may be thought of as having three broad parts.

Part I (Lessons 1-4) introduces the unit and sets up some long-term assignments and experiments that will be reported on at the end of the unit. It also contains two lessons—one about toxic chemicals and the other about recycling—that don't involve team presentations. Presenting these lessons early allows student teams time to learn about a particular aspect of the environment and prepare a class presentation.

Part II (Lessons 5-7) focuses specifically on environmental issues of land, air and water, how they impact human health and what each of us can do to be responsible environmental citizens. In these lessons student teams make presentations to the class on their areas of expertise.

Part III (Lessons 8-9) provides the opportunity to integrate what has been learned in the earlier lessons. Students present the results of their long-term assignments and experiments, and class members consider what they can do to preserve the environment.

Finally, included in the appendixes are a glossary of special terms used in the module and a list of organizations to contact for further information about environmental issues.

Objectives

Lesson 1	*The Hunt Is On*	■ Students will be able to identify an environmental issue of concern to them.
Lesson 2	*Our Environment: An Introduction*	■ Students will be able to define *environment.* ■ Students will be able to compare the environmental past and future of a local area.
Lesson 3	*Toxic Chemicals*	■ Students will be able to describe ways that the pervasive use of chemicals poses health threats.
Lesson 4	*A Mountain of Garbage*	■ Students will be able to list the environmental health threats that result from too much garbage. ■ Students will be able to identify personal actions that can reduce the amount of garbage in their communities.
Lesson 5	*The Air We Breathe*	■ Students will be able to explain health consequences of air pollution. ■ Students will be able to identify three global atmospheric crises related to air pollution. ■ Students will be able to identify action steps they can take to reduce or prevent air pollution.
Lesson 6	*The Water We Drink*	■ Students will be able to list three major concerns related to water pollution. ■ Students will be able to identify personal action steps they can take to conserve water.
Lesson 7	*The Earth We Live On*	■ Students will be able to illustrate the relationship between land issues and human health. ■ Students will be able to identify personal actions to help protect the land.

Lesson 8	*The Great Environmental Health Scavenger Hunt*	■ Students will be able to identify products they can purchase and activities they can undertake to be responsible environmental consumers.
Lesson 9	*Think Globally, Act Locally*	■ Students will be able to identify ways in which they can be responsible global citizens in regard to the environment.

Time

The time indicated for each lesson is an approximate measure, based on a 45-50 minute class period. The actual time required to complete all activities in a given lesson will vary, depending on student interest and ability. Lessons that will probably require more than one class period to complete are indicated.

Instructional and Evaluative Strategies

Entering Adulthood: Creating a Healthy Environment uses cooperative learning groups as a primary instructional strategy. In particular, two major assignments are suggested for student teams (cooperative learning groups): (1) a class presentation by each team on an environmental topic; and (2) a scavenger hunt that allows the students to integrate what they are learning in class and to focus on concrete environmental concerns. In addition, some lessons contain specific small-group learning strategies.

Although the emphasis is on team assignments, the curriculum can be taught without using student teams or long-term assignments. Each lesson can be taught by the instructor using the lesson plan and background information provided.

To help you make the most of the learning opportunities and to help motivate students, expansion of the small-group strategy into a team competition is described in Lesson 1.

Make It Real

The natural environment is a critical and dynamic part of our social and political world. There are individuals at all levels within your community who are concerned about environmental issues. You can make this unit more real to your students by inviting guest speakers to visit the class and share their experiences and concerns. Such local visitors can help make global issues more relevant by explaining the link to the local situation. See the list of environmental organizations in the appendix for suggestions of people to contact.

There are also many films, videos and other audiovisual aids that can help you make environmental problems exciting and dramatic issues to discuss. Check with your district's media library for resources.

Field trips are another way to make the environment real. You could visit the garbage dump, a local wilderness area or a power plant to investigate various environmental issues.

There are also many local, national and international service opportunities in environmental protection in which you may want to involve your class. These range from adopting a stream to protect it from pollution to buying trees to replant tropical rain forests.

Finally, you can make the action steps recommended to students more real if you institute some of them in your classroom (whether or not you do this as part of a team competition). For example, you may want to establish a recycling bin for paper or aluminum cans.

Teacher Responsibilities

The environment is always in the news, whether the issue is local environmental hazards, national environmental politics or international cooperation or debates. While the lesson plans provided in this module include enough information to stand alone, learning can be significantly enhanced by using the local newspaper as a supplementary text. Some lessons include specific suggestions for doing so.

Once you get started, you will no doubt find many other ways to use local resources, including the newspaper, library, municipal planning commission, etc., to help students realize that environmental issues are not out there in some ivory-tower way, but rather are real issues with personal impact on the individual.

Modeling is as important in teaching environmental responsibility as it is in every other health education issue. If you show your students by your personal actions that you believe environmental protection is worth the effort, they will follow in your footsteps.

Consider ways to actively practice conservation efforts in your classroom or school. For example, you may choose to place a recycling bin in the classroom or on campus for paper or aluminum cans; your class may work with the custodians to add water-saving devices to school toilets; you may choose to ride your bike to school or organize teacher car pools; and so on.

You should also be aware that some ethnic groups, such as Native Americans, view the earth and the environment in ways that contrast with modern, technologically oriented mainstream society. Whether or not you have Native American students in your class, you will want to be respectful of feelings and attitudes about the environment. See **The Sacred Earth** transparency in Lesson 1 for an example of Native American attitudes toward the environment.

Finally, take advantage of environmental observances, if convenient. April 22 is Earth Day each year; planning your environmental unit around this event can make the issue come alive for students when they see a community-wide relevance to what they are learning in school. Other observances to consider are U.N. Environment Day on June 5, and World Population Week and World Wildlife Week in October.

LESSON
1

THE HUNT IS ON

Objective

Students will be able to identify an environmental issue of concern to them.

Time

One class period.

Overview

This lesson introduces the *Entering Adulthood: Creating a Healthy Environment* module by setting up Environmental Health Detective teams. Students work in these small groups throughout the module to plan a class presentation on an environmental topic and to participate in an environmental scavenger hunt.

In this lesson, students pick a topic of environmental concern, organize team responsibilities and prepare a team report on their plans.

Teacher Materials and Preparation

HAVE:

✓ Overhead projector.
✓ Transparency marker.

COPY:

✓ **Environmental Health Detective Team Instructions**, one for each student.
✓ **Environmental Health Detective Team Assignment Sheet**, one for each student.
✓ **Environmental Health Detective Team Record Sheet**, one for each student and one more for each team.
✓ **The Great Environmental Health Scavenger Hunt Instructions**, one for each student.

MAKE:

✓ Transparency of **The Sacred Earth** and poster (optional) for classroom display.
✓ Transparency of **Environmental Topics** (optional).

REVIEW:

✓ **The Great Environmental Health Detective Competition *Teacher Background Information*.**
✓ **The Great Environmental Health Detective Competition *Teacher Planning Sheet*.**

Procedure

■ Tell students that the 1990s have been called the decade of the environment. Ask students for some examples of environmental issues and problems. Ask students if concern about the environment is a new issue. How long do they think people have been concerned about the environment?

Show students **The Sacred Earth** transparency. Tell them this quotation is part of a letter written to President Franklin Pierce in 1855. The letter was written by Chief Sealth of the Lakota Sioux Duwamish tribe of Washington state. Discuss student reaction to the quotation.

■ Explain to students that as they study the environment, they will be working in small groups called Environmental Health Detective teams. Explain to the class how the teams will work together,

depending on the approach you've chosen. Tell students the long-term team projects will include a scavenger hunt and/or class presentations on a particular environmental topic.

If you plan to have each team make a class presentation, show students the **Environmental Topics** transparency. Tell students that each team will need to choose a different topic for its presentation.

■ Divide the class into teams of five or six students. Decide on a grouping method that works for you. You can assign students to a team, or you can allow them to organize themselves into teams. Have the teams meet and introduce themselves to one another.

Distribute the **Environmental Health Detective Team Instructions,** the **Environmental Health Detective Team Assignment Sheet,** the **Environmental Health Detective Team Record Sheet,** and **The Great Environmental Health Scavenger Hunt Instructions**. Review the worksheets with the class. Have students fill in the date for each team class presentation (as scheduled by you) and the date for the results of the scavenger hunt (allow at least three weeks).

Allow teams 20-30 minutes to review the instructions and organize their efforts. Have teams sign up for their environmental topics. Each team should check off its topic on the transparency, so other teams know which topics have been taken.

■ Toward the end of the class period, meet briefly with each team to be sure students understand their assignments and have organized themselves appropriately. Explain that the **Environmental Health Detective Team Record Sheet** should be turned in at the beginning of the next class period.

Evaluation

Have students list at least two environmental topics that are of concern to them. They can write a few sentences describing why they have identified these topics as a special concern. This can be done orally as well, in discussions with team members or through observations of discussion among team members.

The Great Environmental Health Detective Competition

Teacher Background Information

Since teamwork is an important strategy of this curriculum, you can liven it up by creating "The Great Environmental Health Detective Competition." Student teams compete against one another to earn points for their team accomplishments. The team with the most points wins the competition.

Organize the competition in a way that makes sense to you and your teaching situation. For example, you may wish to award points in the same way you grade other student work, e.g., A = 90-100 points, so an *A* presentation might be awarded the median score of 95. You may choose to do the grading as you do in normal class work, or you may appoint a panel of judges, made up of other teachers, students and/or parents.

Recognize Team Effort

You may choose from several ways to recognize team efforts.

- Select a prize that is environmentally appropriate for the winning team (e.g., gift certificates for each member at the fast-food restaurant determined by students to use the least packaging for its food).
- Use an existing school-wide awards program.
- Establish a class awards system.

Use Other Incentives

You may wish to extend the competition beyond simply the lessons by adding incentives or ways that students can earn additional points.

- Set up a bin in your classroom for recycling aluminum cans (if your school does not already recycle cans elsewhere on the campus). Each student who picks up a can on campus and puts it in the bin for recycling earns a point for his or her team. (You may want to award extra points to the team that volunteers to take the contents of the bin to the recycling center once a week.)
- Offer extra points to students who elect to car pool, walk or bike to school if they have previously been driving.

You will need to assess what works in your school situation to identify these incentives. Students may have some good ideas of their own for such an incentive program.

Other Class Activities

You may want to assign other extra-credit activities that teams could undertake.

- Teams can create a class bulletin board about their environmental topics.
- Teams could be asked to maintain a scrapbook or bulletin board of newspaper articles about local environmental issues.

These articles can be referred to in class to show that the issues under discussion are not somewhere out there, but right here at home.

Beyond the Classroom

Think about things you can do to extend these environmental health learning opportunities beyond the classroom.

- Hold a "Great Environmental Health Fair" for other students, teachers and parents. Display the teams' class presentations and scavenger hunt results. Students can staff their displays and explain their findings to visitors.

- Extend the fair by inviting community organizations interested in the environment to set up additional displays or to provide speakers. Your local water department, waste management company or municipal officials may welcome the opportunity to share information about what they are doing in your community to preserve the environment. Local environmental organizations like the Sierra Club may also be willing to participate.

- Encourage students to engage in a schoolwide environmental audit.
  - Does your school participate in a recycling program?
  - Are there water displacement devices in the toilets?
  - Are low-water showerheads in place in the showers?
  - Are toxic chemicals used in maintaining the playing fields?

- Students could devise and conduct such an audit, advising the administration and/or school board about their findings.

- Students can design and conduct an environmental audit of their homes.

To help you plan the "Great Environmental Health Detective Competition" for this unit, a ***Teacher Planning Sheet*** follows. It presents the items you need to think about in planning a competition and contains a suggested point system. Think through the issues carefully and decide what you want to do.

TEACHER

The Great Environmental Health Detective Competition

Teacher Planning Sheet

Class: _____

Number of teams (5-6 students per team): _____

Method for dividing class into teams (student self-selection, interest in an assigned topic, counting off and grouping, etc.):

_____

_____

Judges: _____

_____

_____

Elements to be judged (class presentation, scavenger hunt results, etc.): _____

_____

_____

Prize(s): _____

Possible Points:

Class Presentation—up to 100 points, including:
40 points for accuracy and comprehensiveness of content
20 points for graphics and audiovisual aids
25 points for presentation skills and preparation
15 points for worksheet

Scavenger Hunt—up to 100 points, including:
15 points for each Eco-Experiment
5 points each for the remaining items
15 points for presentation

Bulletin Board Display:
100 points for first prize
75 points for second prize
50 points for third prize

Newspaper Scrapbooks—up to 50 points, including:
35 points for comprehensiveness of articles
15 points for neatness and presentation

Aluminum Can Recycling:
1 point for each can collected on-campus and placed in recycling bin

Bus/Biking/Walking:*
5 points for each day a team member walks or bikes to school or takes the bus rather than using private automobile, self-recorded on record sheet (honor system)

Others:_____

_____

_____

*Implement only if most or all students live within neighborhood and the opportunity to earn points can be equally distributed across teams.

The Sacred Earth

Every part
of the earth is sacred to
my people. Every shining pine
needle, every sandy shore, every
mist in the dark woods, every clear-
ing and humming insect is holy in the
memory and experience of my people.
The white man... is a stranger who comes
in the night and takes from the land
whatever he needs. The earth is not
his brother but his enemy and
when he has conquered it,
he moves on.

Chief Sealth—1855

TEACHER

Environmental Topics

Outdoor Air Pollution

Indoor Air Pollution

The Greenhouse Effect

Depletion of the Ozone Layer

Acid Rain

Land Degradation

Destruction of Tropical Rain Forests

Water Pollution

Water Conservation

STUDENT

Environmental Health Detective Team Instructions

Your group is going to work as a team while we study environmental health. Your team's job is to find the clues that will help us save our environment. You will put the clues together to solve the mysterious case of environmental destruction.

As a team, it is your responsibility to cooperate with one another, to support one another and to fulfill your part of the assignment.

Team Responsibilities

1. Pick a name for your team that reflects concern for the environment. You may also want to draw a team logo (symbol). Write your team name on the **Environmental Health Detective Team Record Sheet** that will be handed in to your teacher. (Each team member should also keep a copy of this sheet.)

2. Select an environmental health topic for your team to study. When you become "experts" on this topic, you will teach the rest of the class about it. As a group, pick a topic that interests you. Write it on the team record sheet. Each group must sign up for a different topic.

3. Look at the **Environmental Health Detective Team Assignment Sheet**. Decide how you are going to research and present your topic. Divide the tasks equally among group members. Pick another time to meet outside of class, if possible, to review your progress.

4. Look at **The Great Environmental Health Scavenger Hunt Instructions**. Assign each item to a member of your team. Decide how you are going to display or present what you collect.

STUDENT

Environmental Health Detective Team Record Sheet

Directions: Fill in the information on this sheet. Keep a copy for your records. Be sure your teacher gets one copy of this sheet.

1. Team Name: _____

2. Team Logo (optional):

3. Team Topic:

4. Date of Team Presentation: _____

5. Team Assignments:

Team Member	Task
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

STUDENT

Environmental Health Detective Team Assignment Sheet

Directions: Fill in this sheet as you plan your presentation with your team. Each team member should have a completed copy of this sheet.

1. Team topic: _____

2. Date of class presentation: _____

3. Your report to the class should answer the following questions:
   - What is the environmental problem you are discussing?
   - What causes the problem?
   - What impact does the problem have on human health?
   - What can individuals do to help solve the problem?

4. Use visual effects in your presentation to add interest.

5. Prepare a handout with action steps that individuals can take to help solve the problem.

6. Think of interesting ways to involve the class in learning about your topic. For example: Design a take-off on a TV talk show. Have students in the class act as members of the studio audience and ask questions of a panel of experts. Or conduct a series of person-on-the-street interviews with other students, asking their opinions about something related to your topic. Be creative and have fun!

7. Divide the responsibilities (e.g., library research, develop visual aids, write handout, make presentation to class, etc.). Write each team member's name and assignment on the following lines:

Team Member	Task
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

STUDENT

The Great Environmental Health Scavenger Hunt Instructions

Directions: Find or do the following by _____
(date)

On the line following each item, fill in the names of the team members responsible for that item.

1. Collect three products that are safe for the environment. Label each one with the reason(s) it is environmentally safe.

   Team Members: _____

2. Buy the following meal from a fast-food restaurant: hamburger, fries and a milkshake. Save all the packaging and paper goods that are given to you with the food. Label all the pieces with the name of the restaurant and keep them together.

   Team Members: _____

3. Count the number of cars in your school's parking lot on a school day. Count the number of bicycles.

   Team Members: _____

4. Survey ten students at school and ten adults in the community, using these three questions. Report the results.
   a. What is one thing you do to protect the environment?
   b. What is one thing you do that may hurt the environment?
   c. What do you think is the most important environmental problem facing our planet?

   Team Members: _____

STUDENT

5. Collect three household items that are considered hazardous or toxic waste products. Check that they have labels stating how to dispose of them properly.

   Team Members:_____

6. Find a product symbol that indicates a product is safe for the environment.

   Team Members:_____

7. Collect three products that can harm the environment. Label each product with the reasons it is harmful.

   Team Members:_____

8. Make a list of the nearest places to recycle aluminum cans, paper and plastic.

   Team Members:_____

9. Collect three products that are examples of our throwaway society.

   Team Members:_____

LESSON 2

OUR ENVIRONMENT: AN INTRODUCTION

Objectives

Students will be able to define *environment.*

Students will be able to compare the environmental past and future of a local area.

Time

One or two class periods with two optional class periods.

Overview

This lesson introduces students to the environment, its major components of land, air and water, and their interrelationships. Students are challenged to consider the tensions between industrial progress and the need to protect the environment.

The lesson begins with a mini-lecture and class discussion. Students review newspaper articles to identify environmental issues of local concern and discuss the issues in small groups. Optional Eco-Experiments can be completed in class (requiring one or two class periods) or assigned as homework.

Teacher Materials and Preparation

ASSIGN:

✓ Students to search for and bring to class newspaper articles about local environmental issues. Collect some articles yourself, so you will have them if students do not.

HAVE:

✓ Chalk and chalkboard.
✓ Overhead projector.
✓ Materials for Eco-Experiments (optional).

COPY:

✓ **Our Local Environment** worksheet, one for each student.

PREPARE:

✓ **Eco-Experiments** instruction sheets. Make several copies, and cut apart to give to students (optional).

MAKE:

✓ Transparency of **A Planet in Crisis**.

REVIEW:

✓ **The Environmental Crisis** ***Teacher Background Information***.

Procedure

■ Ask students what they think of when they hear the term *environment*. Write their ideas on the chalkboard. Be sure the following points are included:

- An environment is a complex system, made up of interrelated parts.
- We live in multiple environments, including the natural environment, a social environment, a cultural environment, a linguistic environment, a political environment, etc. During these lessons, we are concerned with the natural environment.
- The natural environment is a complex system made up of interrelated parts, including air, land and water.

■ Show students **A Planet in Crisis** transparency. Lead a discussion of the impact of environmental problems on health, using **Teacher Background Information**.

Ask students to consider these questions:

- Which of the environmental issues listed on the transparency do you think will have the biggest impact over the next 25 years? Why?
- Who do you think is responsible for creating these environmental problems? Who is responsible for solving them? (Possible parties: industry, government, individuals, all of the above.)

■ Distribute **Our Local Environment** worksheet. Divide the class into small groups, or have students work with their Environmental Health Detective teams. Ask students to identify local environmental issues caused by human progress in your community. Tell students to use local newspaper articles to find examples of these issues.

Tell students to list two or three of these environmental problems and categorize each problem by component, i.e., is this problem largely one of air, land or water? Students should describe the cause and the impact of each problem. Then students should list the economic benefits that may result (e.g., local jobs are created). Tell students to save the worksheet for future reference.

■ *Optional:* Ask students to continue to collect newspaper articles about local environmental issues. They may do this individually (perhaps for extra credit) or as teams.

■ *Optional:* Eco-Experiments can be done in class or assigned to teams as homework. The Eco-Experiments require tracking over one to four weeks, so it is important to begin them at the start of the curriculum. You may choose to ask each team to do all four experiments or you may assign one experiment to each team.

Evaluation

Ask students to define the meaning of *environment* for them. Students can use a poem, paragraph, drawing, collage or any other medium they choose to create their definition.

Have students compare the past and future environments of their own community. Students should think about:

- what the local environment looked like two hundred years

ago, from the viewpoint of a resident who had just settled here;
- what the local environment will look like one hundred years from now if humankind continues to behave as it does now.

In writing, drawing or by other means, students should highlight prominent features of the local environment, such as a nearby lake, mountain, factory, etc. Students should convey the appearance of the area and its quality of life.

Follow-Up/ Extension

Ask students to take a stance in response to an issue such as the following:

Using paper bags instead of plastic for groceries would help the environment. Plastic does not easily decompose in landfills. When decomposed, it leaks toxic chemicals into the nearby ground water. Should local government pass an ordinance outlawing the use of plastic bags in the supermarket?

This stance can be explained in an essay or debate. Students should identify their position (yes, ban plastic bags; or no, don't ban plastic) and present at least three reasons for their position.

The Environmental Crisis

Teacher Background Information

Clean air to breathe, pure water to drink and land on which to safely plant crops are all basic necessities of life. They are also the three major components of the environment. Yet today, air, water and land are all threatened as the global environmental crisis grows.

Major Concerns

Among the most pressing environmental concerns are:

A possible ***global warming*** trend. Many scientists are concerned that an increase in the amount of greenhouse gases in the atmosphere is causing higher global temperatures. These gases, including carbon dioxide, nitrous oxide and methane, result from fossil fuel emissions. The destruction of tropical rain forests, which absorb carbon dioxide, also contributes to the increased levels of these gases in the atmosphere.

The resulting rise in global temperatures is also known as the ***greenhouse effect.*** Some scientists believe it will cause major changes on earth. In some areas, decreased rainfall could cause crop failure and expanding deserts, while in other areas, rainfall could increase, causing higher sea levels and coastal flooding. The changes could lead to mass extinction of plants and animals, as their habitats changed.

Ozone depletion. The ozone layer in the stratosphere protects us from the harmful ultraviolet rays of the sun. This protective layer is thinning, due primarily to the use of chlorofluorocarbons (CFCs) and halons.
CFCs are used as cooling agents in refrigerators and air conditioners, as propellants for aerosol sprays, as blowing agents for foam insulation and as cleaning agents in electronics manufacturing. Halons are used in fire suppression systems.

Acid rain is rain, snow or fog saturated with sulfuric acid or nitric acid. These acids result from gases formed during the combustion of coal and oil. Acid rain increases the rate of infant mortality and reduces proper lung functioning in humans. It has been estimated to result in the premature deaths of at least 50,000 people per year, as many as are killed in automobile accidents. Acid rain also kills fish, damages tree foliage and degrades soil quality, thereby destroying forests.

An excess of ***garbage*** is overflowing available landfill space. Many materials, like plastics, do not decompose in landfills. Or when they do, they create toxins which seep into nearby ground water, poisoning the environment and posing potential health hazards to humans.

Overpopulation by humankind across the world is outstripping the earth's ability to sustain a desirable quality of life for everyone.

The three major sources of our environmental problems are:

- use of combustible energy by automobiles and industry;
- use of toxic chemicals for manufacturing and agriculture;

- overpopulation around the world.

Economic growth has brought prosperity and ease to much of the world. In the United States, cars make it possible to travel long distances quickly and commute to work in nearby communities. Our food is perfectly preserved and packaged for cleanliness, convenience and attractiveness. Computers, television and radio allow us to communicate quickly with one another and manipulate large amounts of data.

Yet this prosperity and ease has been bought at a terrible price—the destruction of the natural environment. The dilemma for mankind now is to find a balance between the need to grow economically and the need to protect the environment.

Our natural environment is a complex system of interrelated parts: the major components are air, land and water. Contamination in one of these components affects the others: Combustible fuel emissions escape into the air, return to earth through acid precipitation, which injures our lungs and degrades the water and soil, thereby destroying the safety of the fish and food we eat.

Major Health Threats

The following are some of the major health threats posed by environmental problems:

Air pollution, including smog and acid rain, has been linked to increases in the following illnesses:

- Diseases of the respiratory system, such as asthma, emphysema, lung cancer, pneumonia and bronchitis. All parts of the respiratory system, including the nose, sinuses, throat, bronchial tubes and lungs, have direct contact with the air we breathe. Sulfates are the most troublesome pollutant in the air for the respiratory system. Sulfates are produced by sulfur dioxide as a result of burning coal and oil.

- Diseases of the heart and blood vessels. Pollutants breathed into the lungs can pass into the bloodstream through the membranes of the lung. Air pollution can also increase the risk of heart attack, because the struggle to breathe can strain the heart.

- Cancers, in addition to lung cancer. Carcinogens in the air enter the body through the lungs and skin. They may travel to other organs through the blood.

- Skin disease, allergies, eye irritation are exacerbated for people with heart or lung problems and for the very young and very old.

The air we breathe at home is often as polluted as the air outside our doors. These home pollutants come from aerosol sprays, cigarette smoke, foam insulation, cleaning and cooking compounds, etc. Radon is another dangerous substance in homes in many parts of the country.

Air pollution can also include noise pollution. Noise, traveling on sound waves within the air, can result in hearing loss and stress. In addition to loud industrial noises, home appliances may produce noise in a range that is potentially harmful.

Water pollution in developing countries is often caused by contamination from human waste. This can result in infant diarrhea, which can be fatal. Malaria, typhoid and cholera are all waterborne diseases. Another water-linked

disease is schistosomiasis, transmitted by a waterborne parasite. These diseases kill an estimated 25,000 people each day.

In both developing and developed countries, industrial development and poor land use contribute to water pollution problems. Toxic waste is dumped in streams and rivers or into landfills, where it seeps into the ground water below the surface of the earth. Cancer, birth defects and miscarriages have been associated with such dumping, as in the infamous Love Canal area of Niagara Falls, New York, in the mid-70s.

Other water pollutants that can cause health problems include the salt that is used to melt snow in cold-winter areas. When the snow melts and runs into the water supply, the presence of salt contributes to an increased risk of heart attacks and stroke through increased high blood pressure.

Land pollution occurs indirectly from several sources. Air and water pollution degrade the soil. Garbage and toxic waste seep into the water and then pollute the land. Pesticides used in agriculture seep into the ground water, kill plants and animals and negatively impact the quality of the food we eat and the health of farm workers exposed directly to them.

Ninety percent of the pesticides used for agriculture have never been tested for long-term health effects. Pesticide exposure can cause cancer, birth defects and damage to various body organs. About 50,000 causes of pesticide poisoning are recorded each year in the United States. Children are more vulnerable to pesticides than are adults, because children consume more food and air, pound per pound, than adults.

Radiation from X-rays and radioactive substances can be harmful. Ionizing radiation from these sources can damage cells, causing leukemia and other cancers, as well as birth defects. The thinning of the ozone layer in the earth's stratosphere allows greater ultraviolet radiation from the sun to reach earth.

Scientists are predicting an increase in cases of skin cancer and eye cataracts as a result of this thinning (in addition to crop damage and destruction of marine life, which destroy the food chain on which we depend). In fact, the incidence of deadly melanoma has been increasing in recent years. Radiation from nuclear accidents also remains a fearful possibility.

TEACHER

A Planet in Crisis

Major Concerns

Greenhouse Effect

Ozone Depletion

Acid Rain

Garbage

Overpopulation

Health Threats

Air Pollution

Water Pollution

Land Pollution

Radiation

STUDENT

Our Local Environment

Directions: With your group, identify two or three local environmental issues. For each issue, describe the problem and note whether it relates to air, land or water. Then discuss each issue with your group. Note the cause, impact and benefits of each issue.

1. Problem: _____

_____

_____

Air, Land, or Water? _____

Cause: _____

_____

_____

Impact: _____

_____

_____

Benefits: _____

_____

_____

2. Problem: _____

_____

_____

Air, Land, or Water? _____

STUDENT

Cause: _____

_____

_____

Impact: _____

_____

_____

Benefits: _____

_____

_____

3. Problem: _____

_____

_____

Air, Land, or Water? _____

Cause: _____

_____

_____

Impact: _____

_____

_____

Benefits: _____

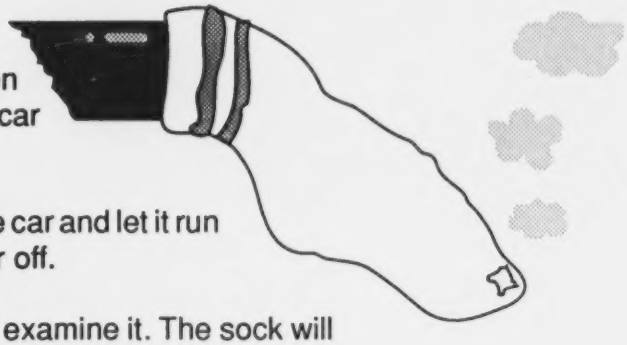
_____

_____

STUDENT

Eco-Experiments

Eco-Experiment #1

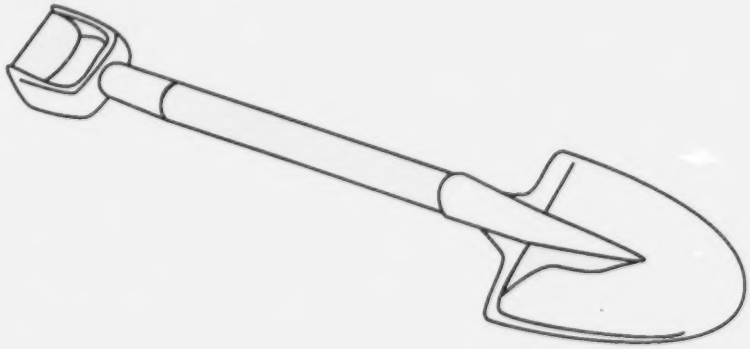


- Put an old white sock over the tailpipe of a car (do this only when the tailpipe is cool, not after the car has been running).
- Ask a licensed driver to turn on the car and let it run for one minute. Then turn the car off.
- Take the sock off the tailpipe and examine it. The sock will be full of pollution that is normally invisible to us.

Eco-Experiment #2

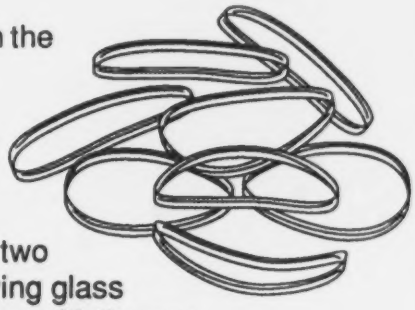
- Collect an apple core, lettuce leaf, plastic package and piece of Styrofoam.

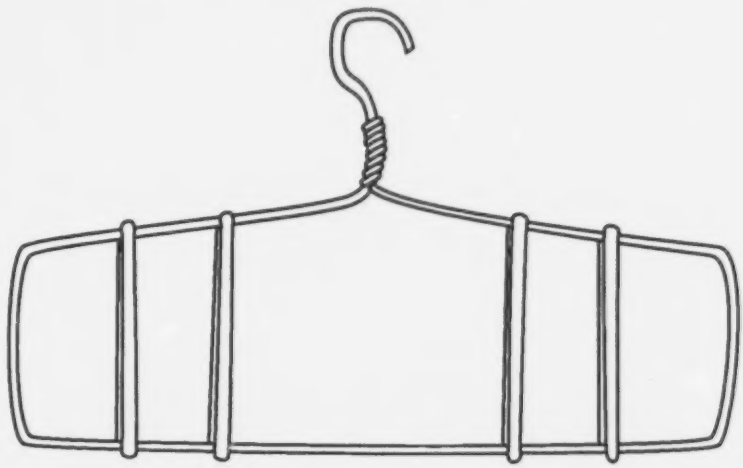
- Dig four holes in the ground. Bury each item in one of the holes. Mark the spots so you can find them again.
- One month later, dig up the items. You'll find the plastic and Styrofoam but not much of the lettuce and apple core.
- Display what you dug up. Use index cards to label your display with an explanation of what happened.



Eco-Experiment #3

- Collect eight natural rubber bands, two coat hangers, a plastic bag and a magnifying glass.
- Bend each coat hanger into a rectangle. Slide four rubber bands onto each hanger, making sure they're stretched tight.
- Hang one hanger outside in a shady place away from the sun.
- Seal the other hanger in the plastic bag and keep it indoors in a drawer.
- After one week, examine the rubber bands on the two hangers for cracking and breaking. Use the magnifying glass to examine them closely, comparing the outside hanger with the one from inside. If you live in an area that is highly polluted, the rubber bands on the hanger outside may be broken because smog has been eating away at them. If not, hang the outside hanger back outside. Check the hangers weekly and report the results.



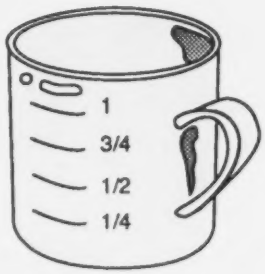


Eco-Experiment #4

☞ Collect three one-quart jars with lids, some measuring cups, three small potted plants of the same variety, a bottle of vinegar or lemon juice, masking tape and a pen.

☞ Use the masking tape to make two labels that say "a little acid." Put one label on one of the jars and the other on one of the pots.

☞ Pour 1/4 cup of vinegar into the jar you have labeled. Fill the jar the rest of the way with cold water.



☞ Water the plant marked "a little acid" with the vinegar/water mixture.

☞ Now make two labels that say "a lot of acid." Put these labels on another of the jars and pots. Pour one full cup of vinegar into the jar, and fill it the rest of the way with water. Use this water to water the pot marked "a lot of acid."

☞ Write "tap water" on the last two labels. Put these labels on the last pot and the last jar. Fill the jar with water, and use this water to water the plant labeled "tap water."

☞ Set the plants next to each other, so they get the same amount of sunlight.

☞ Water the plants every two to four days, making sure you water each pot with the corresponding jar of water.

☞ After one month, describe the differences among the three plants on an index card. This experiment demonstrates the effects of acid rain on plant life.

Adapted with permission from The EarthWorks Group. 1990. *50 Simple Things Kids Can Do to Save the Earth.* Berkeley, CA: The EarthWorks Press.

LESSON
3

TOXIC CHEMICALS

Objective

Students will be able to describe ways that the pervasive use of chemicals poses health threats.

Time

Two class periods.

Overview

More than 65,000 synthetic chemicals are on the market. Many of these greatly enhance our standard of living. On the other hand, some chemicals can be harmful to use and may even destroy our environment.

This lesson begins with class discussion of the hazards of toxic chemical use. Students then work in small groups to review factual information about specific toxic chemical hazards. The groups prepare short summary reports for the class about what they learned. The lesson can be extended by asking student groups to do additional research on the topics covered in the fact sheet and make formal class presentations with visual aids, worksheets, etc.

Teacher Materials and Preparation

HAVE:

✓ Chalk and chalkboard.

COPY:

✓ **Facts and Headlines** information sheets, enough copies of each sheet for all members of a team or small group to have a copy of the same sheet.

✓ **Danger: Toxic Chemicals** worksheet, one for each student.

✓ **Better Living Through Modern Chemistry?** worksheet, one for each student.

REVIEW:

✓ **Toxic Chemicals** ***Teacher Background Information.***

Procedure

■ Conduct a brief class discussion of toxic chemicals, using ***Teacher Background Information.***

■ Explain to students that they are going to work in small groups to learn about some specific toxic chemicals. Then each group will share the information it learns with the rest of the class. (Students can work with their Environmental Health Detective teams or in small groups.)

Distribute a different **Facts and Headlines** information sheet to each group, giving groups enough copies for each student in the group. Distribute the **Danger: Toxic Chemicals** worksheet to each student to use as groups prepare their reports.

Give students ten minutes to read the information and organize an oral report that is no more than five minutes long. All members of the group should participate in preparing the report. At least two members should participate in the oral presentation. In preparing the report, the group should try to answer the questions on the **Danger: Toxic Chemicals** worksheet.

■ After each report, discuss the following questions:

- Were there positive uses for the chemical?
- Were the environmental hazards known from the beginning?
- Are the uses of this chemical regulated well enough to prevent harm?

- What is the trade-off between the help this chemical offers and the harm it may do?

■ *Optional:* Ask students to look through their collection of local newspaper articles about the environment. Do any discuss the threats toxic chemicals pose to your community's health and well-being? What actions are being taken in the community to deal with these threats?

Ask students to think about actions they could take to deal with such threats. For example: High school students in Huntington Park, Calif., organized a protest and a petition drive against a proposed toxic waste disposal facility in their community. The school board then passed a resolution against the proposed plant, and a copy of the resolution was sent to the governor. Two years later, the plant had not been built.

Evaluation

Distribute the **Better Living Through Modern Chemistry?** worksheet, and have students complete it. Assess students' ability to describe ways health is threatened by chemical use.

Follow-Up/ Extension

Instead of teaching this lesson entirely during class time, ask students to assume responsibility for conducting additional research about a toxic chemical and reporting it, either as an oral presentation or a written report. Such a report could include visual aids, such as charts, graphs, etc.

You may choose to divide the class into small groups and assign each group one of the chemicals addressed in the **Student Fact Sheets**. Or you may allow each student or team to identify, research and report on other toxic chemicals. Reports on other chemicals could also be treated as an extra-credit assignment.

Toxic Chemicals

Teacher Background Information

Chemicals that are harmful are called *toxic*, or poisonous. Some are dangerous in quantities so small that they can be detected only with sophisticated instruments capable of detecting chemicals present in parts-per-billion or even parts-per-trillion amounts. Some cause health problems many years after exposure.

Toxic chemicals enter the body in one of three ways: through the lungs, through the skin or through the lining of the stomach or intestines during digestion. Once the chemical has entered the body by one of these means, it can be passed on to the bloodstream and is then carried throughout the body.

Some chemicals—such as lead, which can cause anemia, learning disabilities in children and hypertension in men—may be taken into the body in more than one way. For example, lead is often found in drinking water and can be inhaled from dust in lead paint.

While immediate reaction to toxic chemicals may include reactions such as nausea or fatigue, there may be no immediate noticeable symptoms. Cancers and birth defects are two critical health concerns related to long-term exposure. These impacts may be explained by cellular changes in the body, as a delayed or gradual result of exposure to chemicals.

Since World War II, our technological skill has introduced into the world hundreds of thousands of new synthetic (man-made) substances. We no longer derive the chemicals we use only from naturally occurring materials—plants, animals and minerals that evolved in the same environment in which people have always lived.

In the chemical revolution of the last 40 years or so, we have created about five million synthetic compounds—three million since 1971 alone. About 65,000 are in commercial distribution. Most serve us well, but some pose a serious threat when used improperly or when they enter the environment in ways that were not intended or anticipated.

The Toxic Substances Control Act of 1976 authorized the Environmental Protection Agency (EPA) to regulate production, use and disposal of a chemical. Still, it is hard for EPA to keep up with the testing of so many new substances.

STUDENT

Facts and Headlines

PCBs Pollute Environment

- Polychlorinated biphenyls (PCBs) are a family of oily, synthetic chemicals that became popular in the 1930s.
- PCBs are used in making electrical products. They do not burn or corrode easily, and they are excellent insulators. Originally, they were used in transformers and capacitors, some of the electronic components of television sets and similar products. They were also used in condensers in air conditioners and refrigerators. PCBs were also used in paints, pesticides, tape and envelope adhesives, plastics and upholstery fabrics.
- In 1976 the Environmental Protection Agency (EPA) banned the manufacture, processing, distribution and use of PCBs except in totally enclosed electrical equipment.
- Millions of pounds of PCBs have spilled or leaked into the environment. PCB vapors entered the air when waste that contained PCBs was burned.
- Workers who handled PCBs developed severe acne. They also suffered from fatigue and loss of appetite. Some of these workers died from liver damage.
- In 1968 PCBs leaked from a heating system in Japan into rice oil that was later used in cooking. More than a thousand people were poisoned. They suffered from fatigue, nausea, swelling of the limbs and liver injury. Mothers who used the rice oil had babies that were very small and developed poorly.
- PCBs have polluted lakes and rivers and have been absorbed by fish and shellfish. When fish or animals absorb PCB, the chemical is stored in the fat cells.
- Freshwater fish are the main source of PCBs for Americans. Almost everyone in the United States has some trace (very small) levels of PCBs in their body fat.
- In 1979 the Food and Drug Administration (FDA) limited the amount of PCBs allowed in fish, poultry and dairy products to 2 parts per million.
- PCBs cannot be destroyed easily. They will hang around in the environment for a long time. It is estimated that there are 400 million pounds of PCBs still in use. Almost 300 million pounds are in landfills, and 150 million pounds are circulating in the soil, water and air.

STUDENT

Facts and Headlines

DES Daughters Develop Cancer

- Diethylstilbestrol (DES) is a man-made hormone. It was first used as a drug for pregnant women to prevent miscarriage.
- Doctors prescribed DES for about two million women in the United States between 1940 and 1971. In 1971 it was discovered that the daughters of women who had taken DES while pregnant were developing a rare cancer at very high rates. DES use during pregnancy was then banned by the FDA.
- Some reports show that the sons of mothers who took DES are more likely than other men to be sterile.
- The women who took DES were more likely than other women to develop cancer.
- Until 1979 DES was also used to increase growth in cattle and sheep. It was added to grain or implanted under animals' skin. Traces of DES were found in meat. These traces were considered a carcinogen (something that causes cancer). In 1979 the Food and Drug Administration (FDA) banned the use of DES in livestock feed.

STUDENT

Facts and Headlines

Chemical Accidents Threaten Thousands

- On December 2, 1984, there was a major chemical accident in Bhopal, a city in central India. The site of the accident was a plant that made pesticides. The plant was owned by Union Carbide Company.

- In the accident, 30 tons of methyl isocyanate (MIC) escaped from a tank into a nearby area where 200,000 people lived. The accident was blamed on a combination of management error, badly designed equipment and poor maintenance.

- Between 2,000 and 10,000 people died as a result of the accident. As many as 20,000 people were disabled by breathing in the toxic fumes of MIC.

- The ailments that resulted from exposure to MIC included lung damage, eye inflammation and damaged eyesight, abdominal pains and vomiting blood, fatigue and depression.

- There have been other major chemical accidents in the world.
  - ✓ A chlorine leak at a Union Carbide plant in West Virginia sent 134 people to the hospital.
  - ✓ During a fire at the Sandoz chemical factory in Switzerland, more than 30 tons of pesticides, fungicides and chemical dyes exploded into the Rhine River. As a result, over 500,000 fish were killed, and water used by humans was polluted.
  - ✓ In 1988, a fire at a chemical plant in Southern California forced the evacuation of as many as 27,000 people from their homes. Seventy people were treated for injuries caused by breathing fumes from the toxic cloud released by the fire.

Facts and Headlines

Lead: Hazardous to Children's Health

- Lead poisoning is one of the most common environmental diseases of children in the United States.
- Children are exposed to lead in leaded paint, leaded gasoline, drinking water and food. Some dust and soil also have leaded paint or gas in them. Leaded paint and water are the most widespread sources.
- Lead gets into water from lead pipes or from the lead solder in pipes.
- Young children often gnaw on painted furniture or window sills, especially when they're teething. In some older housing, this paint may contain lead. Before lead poisoning was discovered, leaded paint was commonly used in homes. Food was stored in cans soldered with lead.
- Efforts have been made to reduce the risk. For example, most newer cars use lead-free gasoline. But it has been discovered that lead poisoning can be caused by even lower levels of lead than were previously thought.
- The effects of lead poisoning include lower intelligence, slower reaction time, slower development, lower weight at birth and reduced size in children to the age of eight, and encephalopathy (changes in brain structure).

STUDENT

Facts and Headlines

PVC Contamination Causes Cancer

- Vinyl chloride is a man-made chemical that is a colorless gas at room temperature. Its primary use is in the production of polyvinyl chloride (PVC). This plastic is used to make pipe, electrical wire and cable coatings, flooring, furniture, toys, packaging, clothing, and automobile parts and upholstery.
- Vinyl chloride has a mild, sweet odor. You can only smell it when it's present in unsafe levels.
- Vinyl chloride can pollute the air and contaminate ground water. The exposure comes from manufacturing and hazardous waste sites. About 2 percent of the nation's drinking-water supply may be contaminated with vinyl chloride at levels high enough to be of concern.
- Most of the people at risk from vinyl chloride poisoning are workers in PVC production plants.
- Vinyl chloride can be inhaled or ingested. The chemical is absorbed into the bloodstream and travels to all organs of the body, especially the liver and kidneys. Chronic liver disease and liver cancer are the most common diseases associated with vinyl chloride poisoning.
- Alcoholics and heavy drinkers whose livers may already have been damaged by alcohol are at higher risk for vinyl chloride poisoning.
- During the childbearing years, women should avoid exposure to vinyl chloride, because it may cause birth defects.

STUDENT

Facts and Headlines

Malathion—Protection or Poison?

- In California, farmers spray their crops with a pesticide called malathion. The pesticide is used to kill the Mediterranean fruit fly, which lays its eggs in farm produce. The agricultural industry in California is a major part of the state's economy.
- The pesticide is mixed with corn syrup and sprayed on crops at night by helicopter. Multiple sprayings are usually required.
- Some agricultural areas are near residential areas. The spray has also been used in residential areas.
- Some people believe that repeated exposures to malathion have a negative impact on health.
- The health impact of malathion is not fully known. One study estimated that 5.5 children in a million risked cancer after six exposures to the pesticide. In another study, a group of homeless people in an area where spraying took place had flu-like symptoms that were diagnosed as malathion poisoning.
- In 1990 state officials believed that the level of malathion used in the sprayings was not toxic to humans.

STUDENT

Danger: Toxic Chemicals

Directions: Read the fact sheet on the chemical assigned to your group. Then work with the group to prepare a five-minute report for the class. The report should answer the following questions:

1. What is the full name and the popular (or shortened) name of the chemical you are discussing?

2. What is the chemical used for?

3. What kinds of environmental threats does the chemical pose?

4. Why do people feel the chemical is toxic?

5. What is being done to regulate the chemical?

STUDENT

Better Living Through Modern Chemistry?

Directions: Answer the following questions.

1. Name two chemicals discussed in class that have been shown to be harmful to people.

2. Explain how each of the two chemicals you named is harmful to people.

3. How do harmful chemicals enter our bodies?

4. Name two government agencies that regulate chemicals in the United States.

5. Do you think any of the chemicals we are using now may be harmful to us? Why or why not?

LESSON 4

A MOUNTAIN OF GARBAGE

Objectives

Students will be able to list environmental health threats that result from too much garbage.

Students will be able to identify personal actions that can reduce the amount of garbage in their communities.

Time

One class period.

Overview

This lesson begins with an out-of-class assignment. Students collect all of their personal garbage over a two- to three-day period in a paper or plastic bag. They carry the bag with them at all times, so *all* garbage (including chewing-gum wrappers, fast-food containers, etc.) is placed in the bag.

The class period is spent discussing the amount of garbage Americans unwittingly create, its impact on the environment and

human health and ways to reduce the amount of garbage we generate.

Teacher Materials and Preparation

ASSIGN:

✓ Students to collect all personal garbage over a two- to three-day period in a bag they carry with them at all times. Make this assignment the Friday before the class in which the lesson will be taught.

HAVE:

✓ Chalk and chalkboard.
✓ Large garbage cans to collect student garbage, with a sign for each.
✓ Overhead projector.

COPY:

✓ **A Mountain of Garbage** student information sheet, one for each student.
✓ **Don't Throw It Away—Reduce and Recycle** worksheet, one for each student.
✓ **Pledge for Action—Garbage** worksheet, one for each student.

MAKE:

✓ Transparency of **Don't Throw It Away—Reduce and Recycle**.

PREPARE:

✓ A sign for each garbage can indicating the way garbage is sorted for your local recycling center (glass and plastic, cans, newspaper, non-recyclable).
✓ Find out where the local garbage dump is.
✓ List the recycling programs that are available in your community.

Procedure

■ Begin this lesson before the class period in which it will be discussed by assigning the garbage collection. Tell students that they are to collect and carry around all their personal garbage for a two- to three-day period. Suggest that students use a large paper

bag to collect the garbage. However, note that if the bag becomes too messy or begins to smell, students can switch to a plastic bag. This is not going to be an easy task for students. Spend some time developing their support and involvement. Explain that the purpose is for each of us to appreciate how we contribute to the throwaway society.

Tell students that they need to carry their garbage everywhere—on dates, to practice, to work, to other classes. Enlist the support of the school administration, and warn your teaching colleagues. This can be an enlightening and fun-to-do activity for the entire school.

■ After garbage has been collected, ask students for their reactions to the task. Use the following questions to conduct a class discussion:

- Were you surprised by the amount of garbage you collected?
- What kind of garbage did you create the most of? (paper, plastic, kitchen scraps, etc.)
- After you put this garbage into a garbage can, what do you think happens to it?
- About how much of your garbage will decompose within the next six months?

■ Have each student sort his or her garbage into the four trash cans in class. The trash cans should be labeled for recycling. For example: Label one trash can *cans*; another, *plastic and glass*; and another, *newspapers*. These signs will vary depending on the sorting system of your local recycling center.

The last of the four trash cans should be labeled *non-recyclable*. *Note:* Polystyrene can be recycled. However, it is not usually sorted with the other types of plastic. Unless your local area has a system for sorting polystyrene, Styrofoam containers need to go into the *non-recyclable* trash can.

After students have sorted their own garbage, ask them to reflect a little on what they see as a class collection of garbage. Will most of the non-recyclable garbage decompose easily? Ask for volunteers to take the full trash cans to the recycling center and the dump.

■ Distribute **A Mountain of Garbage** student information sheet, and allow students time to read it. Then lead a class discussion of

the reading. End by asking the class this question: What are the major environmental health threats posed by too much garbage?

List student responses on the chalkboard.

■ Ask students what suggestions they have for coping with the garbage crisis. Distribute the **Don't Throw It Away—Reduce and Recycle** worksheet. Show students a transparency of the worksheet. Review the action steps with the class.

Ask the class what recycling centers are available in your community; be prepared to tell them where they can recycle. *Optional:* You may wish to ask students to find out what recycling programs are available, either as a class assignment or for extra credit.

■ *Optional:* Refer students to their collection of local newspaper articles. Where is your community's local garbage dump? Is it full? What other alternatives are being considered by local authorities to manage the solid waste created by local residents?

■ Distribute the **Pledge for Action—Garbage** worksheet. Ask students to identify at least one action step they will take to personally reduce the garbage crisis.

Evaluation

Assess student participation during class discussion to determine their ability to list environmental health threats posed by too much garbage. Or have students list and explain in writing at least two threats and turn the list in for evaluation.

Read students' pledges for action to determine their identification of personal actions that can reduce the amount of garbage in their communities.

Follow-Up/ Extension

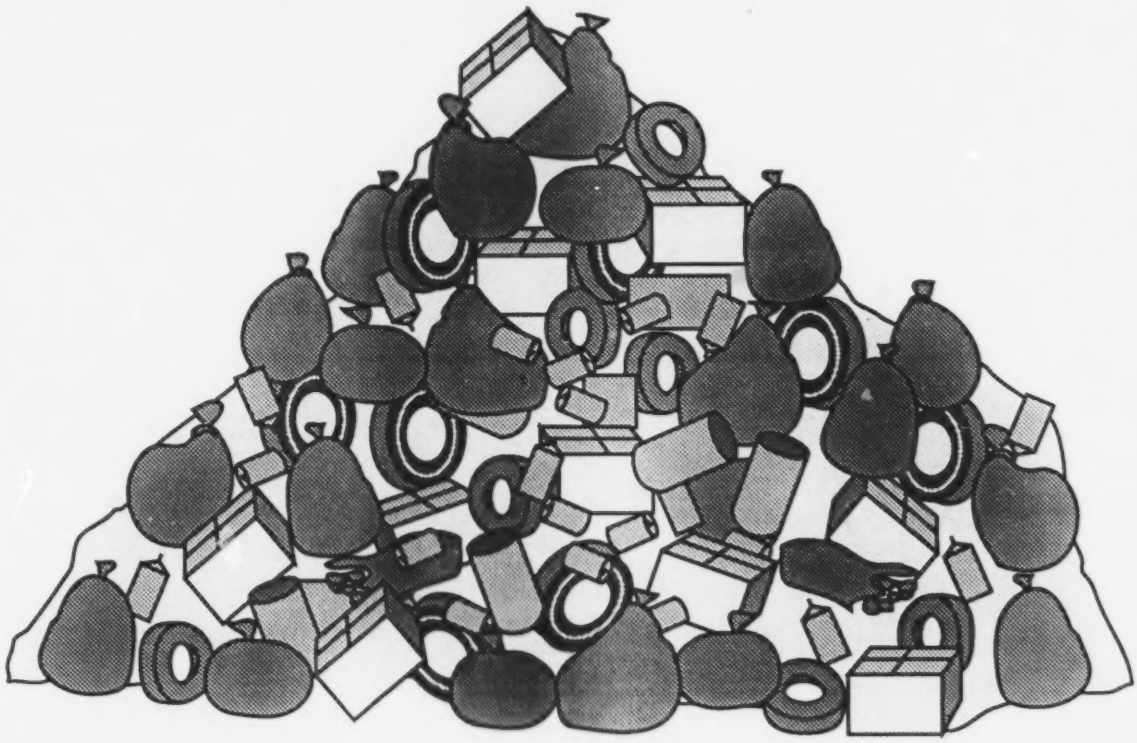
Have students write a two-paragraph position paper on the following topic: Should citizens pay for garbage disposal by the pound—yes or no? Each student should cite at least three reasons for his or her position.

Ask students to discuss recycling possibilities with their families and come up with a family contract similar to the personal contract written in the lesson.

As a class, the students could investigate recycling possibilities at the school, if no recycling is done now. A series of tasks could be organized, including: a student and teacher survey about whether recycling is important and how likely they would be to participate; presentations to the principal and faculty about student desires for a recycling program; research and interviews with local authorities or waste management officials about how a recycling program at the school site might be managed.

STUDENT

A MOUNTAIN OF GARBAGE



"America to Be Buried Alive!" screams the headline. Is this some sinister plot to destroy the United States? No, it's merely a dramatic way to draw attention to the fact that we are running out of places to put all the trash and garbage that we produce. Something has to be done about it. The question is what?

Where Does It Go?

Americans throw out 160 million tons of garbage each year—that's enough to spread 30 stories high over 1,000 football fields. More than two-thirds of the nation's landfills (garbage dumps) have closed since the late 1970s. One-third of the remaining dumps will be closed by the mid-1990s. There are laws against dumping trash into the ocean.

So where's it all going to go? Where did it come from in the first place? And who cares, anyway?

The answer to the first question is that there is no place for it to go. The only solution is to reduce the amount of garbage we create and to find new ways to handle it. The real keys are to ***reduce*** the amount of trash and to ***recycle*** and ***reuse*** what we can.

Where Did It Come From?

To answer the second question—where did it all come from?—we have to look at our own lifestyles. We live in a throwaway society.

How many times have you ordered a fast-food hamburger that came wrapped in paper inside a Styrofoam box? How often do you carry disposable foil-lined juice packs, complete with shrink-wrapping and a plastic straw, to school or to a game, only to toss them in the garbage can (or worse, leave them on the ground) when you're finished? How often do you use a plastic razor to shave, then throw it out when the blade gets dull? How much junk mail comes to your house each week?

Who Cares?

And should we care about garbage? We'd better. The more garbage we create, the more we have to get rid of. Burning garbage often releases chemicals that pollute the air and increase the greenhouse effect. Burying and dumping garbage can pollute the land and water nearby, which threatens the health of local residents. In landfills, garbage and paper products decompose and can form explosive methane gas.

Hazardous industrial wastes are another problem. Hazardous waste is any waste that contains substances that may harm human health. Many kinds of industrial waste contain dioxins. People exposed to these dioxins can suffer headaches, nausea, rashes, acid burns, kidney and liver damage, cancer and birth defects.

The chemical and petroleum industries are the largest creators of hazardous waste. Smaller businesses also contribute, when they throw out lead batteries, acids, solvents, photographic wastes and dry-cleaning residues.

Some of these hazardous chemicals can also get into the regular garbage if you just throw hazardous household products out with the rest of the trash. These products include many household cleaners, motor oil and other automobile products, paint thinners, glues and garden sprays.

STUDENT

Don't Throw It Away—Reduce and Recycle

Ways you can contribute to a better environment

Reduce the amount of garbage you create.

- Avoid over-packaged products.
- Don't use disposables (for example, razors, silverware, diapers).

Reduce the amount of hazardous waste you dispose of carelessly.

- Read the labels on all household cleaners, paints and car products (for example, motor oil).
- Don't just throw them in the trash.
- Follow the label directions for proper disposal.

Recycle what you can.

- Recycling reduces the amount of garbage created.
- Recycling saves the energy needed to make a new product.
- Saving manufacturing energy reduces air and water pollution and slows down the global warming trend.

Materials that can be recycled

- Aluminum and tin cans
- Glass
- Plastics
- Paper

STUDENT

Pledge for Action
Garbage

I, _____, promise that I will

_____

_____

_____

to help solve the garbage crisis.

_____

Signature

_____

Date

LESSON
5

THE AIR WE BREATHE

Objectives

Students will be able to explain health consequences of air pollution.

Students will be able to identify three global atmospheric crises related to air pollution.

Students will be able to identify action steps they can take to reduce or prevent air pollution.

Time

Two class periods.

Overview

Environmental concerns about air quality include both outdoor and indoor air pollution. But pollution is not the only threat to the atmosphere. Global concerns include the greenhouse effect, ozone depletion and acid rain.

This lesson begins with a mini-lecture and discussion about air pollution presented by student Environmental Health Detective teams. Then students complete worksheets on action steps they can take to prevent or reduce air pollution.

Teacher Materials and Preparation

HAVE:

✓ Overhead projector.

COPY:

✓ **Air Pollution Action Steps** worksheet, one for each student.
✓ **Pledge for Action—Air** worksheet, one for each student.

MAKE:

✓ Transparency of **Breath of Life**.
✓ Transparency of **The Ins and Outs of Air Pollution**.

REVIEW:

✓ **Is the Air Hazardous to Your Health?** ***Teacher Background Information.***

Procedure

■ Begin the lesson with class presentations by the Environmental Health Detective teams that have selected air pollution as their topic. In addition to the topics of indoor and outdoor air pollution, presentations on the greenhouse effect, the ozone layer and acid rain should also be made as part of this lesson. *Note:* The following steps may vary, depending on the nature of team presentations.

As necessary, supplement team presentations with information about air pollution from ***Teacher Background Information.***

■ When team presentations are completed, begin a class discussion with the following questions:

- How many times a day do you take a breath? (about 25,000)
- How can the air we breathe hurt us?
- Is breathing hazardous to your health?

■ Show students the **Breath of Life** transparency, and as necessary, review respiration. Tell students that when we inhale, oxygen from the air is carried to the bloodstream. Point out that air enters

our bodies through the nose and mouth. It travels down the windpipe (trachea) and through the bronchi and bronchioles (successively smaller tubes branching off the trachea), finally reaching the alveoli (air sacs).

Explain that when we exhale, carbon dioxide that has moved from the blood stream into the alveoli is passed up the respiratory system to exit through the mouth and nose.

Tell students that toxins in the air we breathe can be absorbed by our bodies in two ways:

1. They move into the bloodstream through the lining of the alveoli and are carried to different parts of the body.

2. If they are water soluble, they are absorbed into body fluids when they contact the moist walls of the mouth, trachea, bronchi, etc., before they reach the alveoli.

Note that some toxic chemicals like chlorine, ammonia and acidic vapors damage the lung tissue if they are breathed in directly. But toxins that are less immediately harmful can be hurtful to your health if you breathe them into your body over a long period of time.

■ Show students **The Ins and Outs of Air Pollution** transparency. Review the cause and the health impact of each source. Emphasize the relationship of outdoor air pollution to global effects in the atmosphere. Use ***Teacher Background Information*** as a guide for this discussion.

■ If the class or some individuals conducted Eco-Experiments 1 or 2 as part of Lesson 2, take a look at the results now and discuss what you learned. It may be too soon to see all the results of Eco-Experiment 4 at this time.

■ Distribute the **Air Pollution Action Steps** worksheet. Ask students which changes seem easy to make, which would be more difficult. Suggest that students take the worksheet home to discuss with their families. Remind students that if each person in the United States chose to take just one action, the cumulative effect of those millions of actions would be tremendous.

■ Tell students to review the local environmental issues they identified on **Our Local Environment** worksheet in Lesson 2. Tell

them to look at those issues that were categorized as *Air.* Ask students if they have found any additional news reports on these issues. If so, ask for volunteers to briefly summarize the latest developments.

For each local issue, ask students what they think residents in your community can do to help prevent or reduce the problem. You may wish to ask students to refer to the **Air Pollution Action Steps** worksheet for ideas as you conduct this class discussion.

■ Distribute the **Pledge for Action—Air** worksheet. Ask students to select at least one action step that they will personally commit to doing. On this worksheet, students should also identify three air pollution issues of global concern. Each student should fill in the worksheet to create a contract with him- or herself.

Evaluation

Ask each student or team to write a letter to the editor of the local newspaper about one of the local environmental issues identified in class. In the letter, the student or team should clearly identify the problem, its causes and its health impact. The letter should conclude with one or more suggestions of what local residents can do to prevent, reduce or combat the problem. *Note:* Before actually mailing any letters, make sure your local newspaper is forewarned. Also find out the newspaper policy regarding how many letters on one subject they will print.

Assess student letters to see if students were able to explain health consequences of air pollution. Review student pledges for identification of personal action steps and global air pollution issues.

Follow-Up/ Extension

As an extra-credit assignment, students could research the political and economic agreements established between the United States and Canada regarding a reduction in acid rain and report on them in writing or orally to the class.

Show a video about acid rain. Check for available titles with your district's media center.

Is the Air Hazardous to Your Health?

Teacher Background Information

Outdoor Air Pollution

The air around us may be polluted if we live in an urban, traffic-congested area or an area with a lot of industry. Over 100 million Americans live in areas that do not meet federal health standards for such common pollutants as carbon monoxide and smog. On a global scale, air pollution contributes to the greenhouse effect, which could result in a drastic warming of the planet.

Sources of air pollution include the following:

- *Motor vehicles* are the single greatest source of air pollution. They spew poisonous fumes into the air through their exhaust systems.
- *Factories and power-generating* plants burn coal or oil, producing sulfur and nitrogen gases and carbon particles through their smokestacks.
- *Residential and commercial heating* contribute to air pollution through the burning of coal, oil, wood or natural gas.
- *Burning of refuse* in open dumps and incinerators releases large amounts of particles and various poisonous gases into the air.

Over 200 million tons of pollutants pour into the air each year in the United States from these four sources. These pollutants include the following:

- sulfur oxides from smokestacks and chimneys
- carbon monoxide, nitrogen oxides and hydrocarbons, mostly from auto exhaust
- photochemical oxidants and ozone, caused by the interaction of sunshine on the hydrocarbons emitted by cars, trucks and buses
- particulate matter, including dust and dirt, smoke and tiny bits of metals
- radioactive particles

Smog or ozone results from a combination of some of these pollutants.

How clean is the air you breathe? This depends on where you live. Someone in a relatively clean suburb or small town might inhale about 40,000 particles of pollutants with each breath, compared to the city dweller, who might inhale 70,000 particles of pollutants with each breath.

Air pollution is also absorbed into the body through the skin. Over time, breathing in polluted air results in respiratory diseases like asthma, bronchitis, emphysema, pneumonia and lung cancer; heart disease; other cancers; and skin diseases and allergies.

Indoor Air Pollution

Although we often hear about outdoor air pollution, we may be less likely to hear about *indoor* air pollution. But living in a house or apartment may also be hazardous to your health.

Medical experts are beginning to recognize sick-house syndrome, a negative reaction to the multitude of chemicals found in most houses today. Symptoms of sick-house syndrome may include a nagging cough, headaches, sleeplessness, irritability and depression. The syn-

drome is caused by toxins released into the air by building materials and household chemicals. When houses are tightly closed up to keep heat inside, these toxins are also held inside. Ironically, the better insulated a house is, the more likely these pollutants are to stay inside.

The best way to get rid of indoor air pollution is to ventilate the house by opening windows and doors and letting the air out. Do so for short amounts of time to minimize energy waste. Plants, particularly philodendrons and spider plants, will also absorb pollutants.

Some of the most common household pollutants include the following:

- *Formaldehyde:* Formaldehyde is used as an adhesive in pressed-wood products, including kitchen cabinets, furniture, paneling and countertops. It releases an invisible gas into the air. Although the fumes are greatest when the products are new, the release of formaldehyde gas continues for many years. It can cause minor eye, nose and throat irritations, shortness of breath, headaches and nausea. Wood products can be sealed with urethane, varnish, shellac or a special formaldehyde sealer to temporarily eliminate the gas.

- *Tobacco smoke:* Cigarette and cigar smoke affects not only smokers but everyone around them. Smoke inhaled by others is called sidestream or secondhand smoke. Children who live in houses with smokers are likely to have more colds and bronchial problems than children who live with nonsmokers. Nonsmokers married to smokers are more likely to develop lung cancer.

- *Radon:* Radon is a colorless, odorless gas formed underground by the decay of uranium in soil and rock. When radon rises from the earth into the open air, it quickly dissipates and poses no detectable risk. It seeps into houses, however, through foundation floors and walls. Once trapped inside, it can accumulate to dangerous levels. As many as one out of ten houses in the United States are estimated to have elevated levels of radon.

  Radon causes as many as 20,000 cases of lung cancer each year. It has been found in houses in all parts of the country. The Environmental Protection Agency considers it the most important threat to public health today.

  The only sure way to know if there is a dangerous level of radon in your home is to have it tested. Local health departments should be able to make referrals to qualified professional testers. If you are not sure about the radon level in your home, avoid living and sleeping in the basement. Seal cracks in the basement walls and floor with caulk or sealant.

- *Asbestos:* Asbestos is a fibrous material that has been used to insulate walls, heating pipes and fireplaces and to strengthen vinyl floors and joint compounds. If asbestos is damaged, it releases tiny fibers into the air which can cause cancer and lung scarring if inhaled over a long period of time. Children are especially vulnerable to asbestos since they breathe more air, pound for pound, than do adults. Asbestos should only be removed by professionals.

- *Household chemicals:* All the products that we use to polish, paint, disinfect, open drains, and repel insects serve to pollute our indoor

air with vapors and fumes. The chemicals used in these products can cause respiratory problems, dizziness, sluggishness, confusion, depression and headaches. Disposing of them improperly can also pollute the outside environment.

- *Heaters and appliances:* Chimneys, furnaces, gas and oil stoves, clothes dryers and water heaters that are damaged or malfunctioning can release carbon monoxide and nitrogen dioxide, two poisonous gases, into the air. If these gases build up, they can cause chronic bronchitis, headaches, dizziness, nausea and fatigue. Make sure gas stoves have an exhaust hood that is vented directly to the outside. Check all gas flames in the house: they should be burning blue. An orange flame may be a sign that carbon monoxide levels are too high.

- *Pesticides:* This is the general term for chemicals use to kill insects, weeds, rodents and funguses. We use pesticides inside the house and outside on the lawn and garden. U.S. consumers use about 65 million pounds of pesticides a year. Of those in use, the vast majority have not been tested for their part in causing birth defects or cancer.

Global Effects

One possible effect of outdoor air pollution has come to be known as the ***greenhouse effect,*** also called *global warming.* Because we've released vast amounts of greenhouse gases (carbon dioxide, methane, chlorofluorocarbons, nitrous oxide and other gases) into the atmosphere, scientists theorize that we have, in effect, turned up the global thermostat. The United States, with only 5 percent of the world's population, is responsible for 25 percent of the carbon dioxide that is released from burning fossil fuels.

Greenhouse gases act like the windshield of a car parked in the sun: they allow light to pass through but then trap heat. The greenhouse effect occurs naturally; without it, the earth would be ice-covered and uninhabitable. Too much, however, results in rising temperatures on earth.

As global temperatures rise, the earth will face a series of potentially disastrous threats. Rainfall in some areas will decline, leading to crop failure and expanding deserts. In others, precipitation will increase, causing flooding and erosion. Mass extinctions of plants and animals will result. Sea levels will rise, flooding coast areas and mixing salt water with fresh water.

Acid rain is rain, snow or fog that contains large amounts of sulfuric acid or nitric acid. The primary cause of acid rain is the combustion of oil and coal by factories and automobiles. When coal and oil burn, large quantities of sulfur dioxide and nitrogen oxides are released into the atmosphere. There they combine with moisture to form sulfuric acid and nitric acid.

The United States is the world's largest producer of the sulfur dioxides and nitrogen oxides that lead to acid rain. What is produced in Midwestern factories impacts air, land and water in New England and Canada.

Acid rain increases the rate of infant mortality and reduces proper lung functioning. For people with asthma, even low levels of sulfur pollution can cause serious lung damage. Some experts believe that as many as 50,000

people per year die prematurely as a result of airborne sulfates—as many people as die in automobile accidents.

Acid rain damages rivers, lakes, soil, trees and forests. When rivers and lakes become too acidic, fish can no longer reproduce and soon die out. High acidity levels also leach heavy metals like mercury and lead from the lake bed. These metals are then absorbed by fish, making the fish unsafe to eat.

In Canada and New England, acid rain has damaged maple trees, threatening the maple syrup industry. In Germany, major forests have been destroyed by acid rain. Soil and ground water are also affected.

In 1985 a hole the size of the continental United States was discovered in the ozone layer over Antarctica. This discovery sparked concern about possible ***ozone depletion***. Ozone is a compound made of three oxygen atoms, in contrast to the two oxygen atoms in the air we breathe. An ozone layer in the stratosphere, 6 to 30 miles above the earth's surface, forms a shield that protects the earth from the sun's ultraviolet radiation. (Don't confuse the ozone in the stratosphere with the ozone in the air we breathe—close to the earth, ozone is a harmful air pollutant that results from burning fossil fuel.)

As the ozone layer thins—as it continues to do—more ultraviolet rays from the sun will reach earth. As the rays increase, experts predict a corresponding increase in cases of skin cancer and eye cataracts, crop damage and the destruction of marine life.

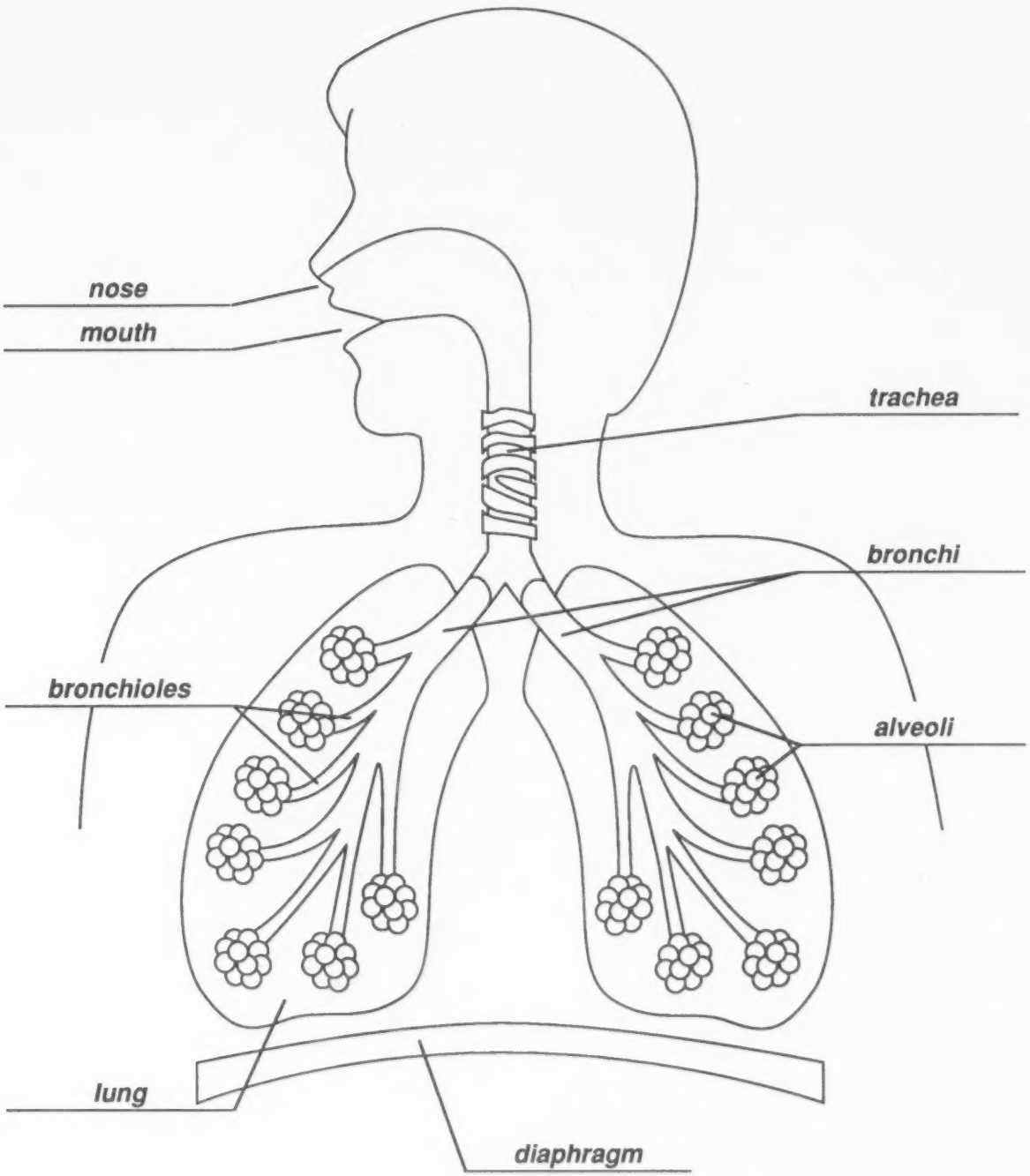
Ozone depletion has been linked primarily to the use of chlorofluorocarbons (CFCs) and halons. CFCs are chemicals used as cooling agents in refrigerators and air conditioners, as blowing agents for foam insulation, as cleaning agents in electronics manufacturing and (in some countries) as propellants for aerosol sprays. Among consumer products, Styrofoam is a major offender. Halons are used in fire suppression systems.

CFCs are very stable, and they remain in the atmosphere for many years. Eventually, they work their way into the stratosphere, where ultraviolet light breaks them apart. The chlorine atom is then freed to catalyze a reaction with ozone molecules, converting them to oxygen molecules. Oxygen molecules cannot protect us from the sun's radiation in the same way ozone molecules do.

In 1987 an international convention was held in Montreal to discuss some possible solutions to the ozone depletion problem. The convention resulted in the Montreal Protocol, which called for a 50 percent reduction in the production of CFCs by 1998. More recently, several industrial countries, including the United States, have called for a total phase-out of CFC use by the year 2000. Dupont Corporation, the world's largest producer of CFCs, has announced that it plans to phase out production of CFCs by that time.

TEACHER

Breath of Life



TEACHER

The Ins and Outs of Air Pollution

Outdoor Air Pollution Sources

* Automobiles (cars, trucks, buses)
* Factories
* Heating
* Burning Garbage

Indoor Air Pollution Sources

* Formaldehyde
* Tobacco Smoke
* Radon
* Asbestos
* Household Chemicals
* Heaters and Appliances
* Pesticides

Global Impacts

* The Greenhouse Effect
* Acid Rain
* Ozone Depletion

STUDENT

Air Pollution Action Steps

In the Community

- Walk or bike whenever possible, or use public transportation.

- If you drive, use your car wisely:
  - Car pool to school, work and other events.
  - Keep your car tuned up and running well.
  - Avoid drive-through lines where the engine idles for a long time.
  - Don't let your car sit and idle to warm up the engine. Instead, begin to drive slowly.
  - Make sure your car has a catalytic converter to reduce emissions into the atmosphere.
  - Try to buy a car with good fuel mileage (35 miles per gallon).

- Buy only the products you really need. Manufacturing plants burn combustible fuels; every product has a hidden environmental cost.

- Recycle. A recycled soda can saves 95 percent of the energy needed to make a new can.

- Be an activist.
  - Support bicycle paths, reduced traffic congestion and recycling efforts in your community.
  - Support local businesses that are working to find cleaner ways to operate.

At Home

- Make your home energy efficient, so it burns less fuel.
  - Insulate the attic, walls, tanks and pipes.
  - Use double-glazed windows, if possible.
  - Caulk window panes.
  - Install weatherstripping around doors.
  - Consider converting to solar energy.

- Read the labels on the products you buy, and look for nontoxic choices. If the label says *Poison* or *Danger*, be aware that the contents are highly toxic. *Warning* or *Caution* also means the contents are toxic.

- Don't pour hazardous chemicals (like paints, automotive products, household cleansers and lawn-care products) down the drain or toilet. Check with your garbage company for proper disposal procedures.

- Use nontoxic chemicals to do the job whenever possible:

Air Freshener	Place vinegar in an open dish.
Drain Cleaner	Use baking soda or salt in the drain, followed by boiling water.
Floor, Window Cleaner	Use white vinegar and water or ammonia and water.
Ant Killer	Use lemon juice and peel.
Roach Killer	Use borax.
Fly Killer	Use sticky flypaper.
Tick & Flea Killer	Wash pet and give an herbal rinse made by adding two tablespoons of dried or fresh rosemary to a half pint of boiling water.

- Maintain your lawn and garden without pesticides and weed killers. Instead, aerate the lawn regularly, water it properly and mow the grass with sharp blades. Make your own compost from kitchen scraps and yard clippings, and use it as a fertilizer for plants.

STUDENT

Pledge for Action
Air

I, _____, promise that I will

_____

to protect the air I breathe.

Global air pollution issues I'm concerned about are:

1. _____

2. _____

3. _____

_____

Signature

_____

Date

LESSON
6

THE WATER WE DRINK

Objectives

Students will be able to list three major concerns related to water pollution.

Students will be able to identify personal action steps they can take to conserve water.

Time

One class period.

Overview

This lesson focuses on water pollution, its impact on the quality of drinking water and the importance of water conservation.

In this lesson, the Environmental Health Detective teams that selected water as a topic make their class presentations. Following class discussion of water problems, students identify action steps they can take to conserve water and reduce pollution.

Teacher Materials and Preparation

ASSIGN:

✓ One or more students to find the source of local water (look under *Water Quality* or *Utilities* in municipal listings in the telephone directory) prior to the lesson. If your school serves more than one community, assign a student from each local town to research this topic.

Students should ask about the source of local water supplies and the systems in place to assure that the quality of the water is healthful. Students should be prepared to report their findings during this lesson. *Note:* Don't assign all students to this task, or you will lose friends at your local water company.

HAVE:

✓ Overhead projector.

COPY:

✓ **Water Conservation Action Steps** worksheet, one for each student.

✓ **Pledge for Action—Water** worksheet, one for each student.

MAKE:

✓ Transparency of **Water Conservation Action Steps**.

REVIEW:

✓ **Water: Essential to Survival *Teacher Background Information*.**

Procedure

■ Have the Environmental Health Detective teams that studied water make their class presentations. *Note:* The following steps may vary, depending on the nature of team presentations.

As necessary, supplement team presentations with a mini-lecture about water, drawing on the material in the ***Teacher Background Information.***

■ Lead a class discussion about water, using questions such as the following:

- What is water pollution?
- How are oceans, lakes and rivers polluted?

- Why is it important to conserve water?

Be sure students understand the three major concerns about water pollution. Often in developed countries, clean water from the tap is taken for granted. Students need to understand that safe, clean water from the tap is a luxury not found in all parts of the world.

It is essential that individuals, industry and governments of all countries recognize the importance of clean, safe water supplies. Everyone must take steps to protect our water supply.

■ Ask for reports from students who contacted local utility or municipal offices to investigate the source and quality of local water.

■ *Optional:* Ask students to review their collection of newspaper articles. Do any articles deal with water pollution or water quality in your community? If not, does that mean local water is safe?

■ Distribute the **Water Conservation Action Steps** worksheet. Show students a transparency of the worksheet and review each step. Ask students to think of other steps that could be added. Suggest that students take the worksheet home and discuss the steps with their families.

■ Distribute the **Pledge for Action—Water** worksheet, and have each student write a personal contract. Students should also list on their pledges three major concerns related to water pollution.

Evaluation

Review student pledges for personal action steps to prevent water pollution and a listing of three major water pollution concerns.

Follow-Up/ Extension

Invite a speaker from your local water utility to visit the classroom and explain to students how water quality is controlled and how water travels from its source into the home and back out.

Water: Essential to Survival

Teacher Background Information

About two-thirds of the human body is water. Water covers three-quarters of the earth's surface. Water is essential to maintaining human life. If our water supply becomes poisoned, we cannot survive.

In the past, health problems due to water pollution were usually caused by the contamination of drinking water with human waste. While that is still true in some parts of the world where people live in unsanitary conditions, concerns in the developed world about water pollution tend to fall into three categories. The first is the quality of the water we drink. Second is pollution of the world's oceans, rivers and lakes. Third is the conservation of our water resources.

Is the Water Safe to Drink?

About half of all Americans depend on ground water under the surface of the earth for their drinking water. Ground water is stored in aquifers, basins below the earth's surface made up of sand and gravel, silt and clay, that act like a natural sponge to absorb and store water. This water is drawn from the earth in wells. Unfortunately, some of this ground water has been contaminated by toxic poisons resulting from industrial and military wastes, use of pesticides by agriculture and leakage from garbage in landfills.

For example, the industrial solvent trichloroethylene (TCE), which is used to degrease metal, has been found in ground water in 3,000 times the concentration found in surface water. TCE is carcinogenic (cancer-causing) in animals and is suspected of being so in humans. Another common pollutant in ground water is vinyl chloride, a confirmed human carcinogen.

In California's Central Valley, a rich agricultural area, 1,400 wells were closed down in 1985 because they were found to contain the pesticide dibromochloropropane (DBCP).

In fact, the U.S. Environmental Protection Agency (EPA) estimates that almost two-thirds of rural Americans are drinking water poisoned with pesticides or other dangerous chemicals. The EPA has listed some 700 compounds rated as dangerous in drinking water and has rated the levels of pollution to be serious in 34 of the 50 states.

If you're not sure about the quality of the drinking water in your home, you can have the quality of your water tested. Contact your local water utility for further information.

Polluted Oceans, Rivers and Lakes

Most of us think of the ocean as infinite and deep. Yet that's not really true. It's illegal to dump waste into the ocean, yet it happens all the time. Over 14 billion pounds of litter gets dumped in the oceans each year, most of it cargo wastes from merchant shipping.

In addition, rivers, lakes and streams are polluted by industrial dumping of chemicals, people and businesses littering, and the run-off of pesticide-enriched soil from farms and forests.

The result? Public beaches are closed because of dangerous refuse in the water. Fish and other wildlife are killed, and the world's biosphere is disrupted.

Conserving a Natural Resource

In the Middle Ages, most people probably used about 3 to 5 gallons of water a day. In the 1800s, that amount jumped to about 95 gallons a day in the West. Today, in the United States, about 1,500 gallons a day per person is used for recreation, cooling, food production and industry.

Conserving water saves energy and money and preserves fresh water habitat. Much energy goes into transporting water to your residence, and then more is used to heat water for bathroom and kitchen uses. By conserving water, it is possible to prevent some of the pollution caused by excessive energy use, such as global warming and acid rain.

In areas where there is not naturally enough water to meet residential and farming needs, water is often diverted from other sources. In the Southwest, for example, increasing amounts of water are now diverted from the Colorado River. As a result, less Colorado River water—water now heavy with pesticides and fertilizers as a result of agricultural use—reaches the sea.

When water is diverted in this way, it can lead to the destruction of wildlife. When rivers shrink as a result of diversion, fish can no longer follow their normal paths of migration to spawn and may fail to reproduce.

When ground water is the source of our water supply and is used faster than it is replenished, it can cause land to sink, a process called subsidence. Once subsidence occurs, the underground aquifers where water was stored cannot be reformed.

In the face of all these hazards to water, conservation is an easy way to help wildlife and protect the environment.

STUDENT

Water Conservation Action Steps

What You Can Do

- Don't let the water tap run while you are brushing your teeth or washing your face. Get the toothbrush or washcloth wet, turn off the water while you scrub, then rinse. Ditto with showers.
- Don't flush the toilet each time you use it. Each flush uses 5-7 gallons.
- Don't let the tap run to cool the water when you're thirsty. Keep a bottle of water in the refrigerator for a refreshing drink.
- _____
  _____
- _____
  _____

Ask Your Family

- Put a water displacement device, like a water-filled plastic bottle, in the toilet tank. You can save 1-2 gallons each time you flush.
- Install a low-flow shower head in your shower.
- Water the grass and the yard only when it needs it. Adjust sprinkler heads to be sure the water goes on the lawn or plants, not on the sidewalk. Water in the early evening, so the hot sun doesn't evaporate the water.
- _____
  _____
- _____
  _____

STUDENT

Pledge for Action
Water

I, _____, promise to do my part to conserve water and avoid polluting it by taking the following steps:

_____

_____

Three major worldwide concerns about water pollution are:

1. _____
2. _____
3. _____

_____

Signature

_____

Date

LESSON 7

THE EARTH WE LIVE ON

Objectives

Students will be able to illustrate the relationship between land issues and human health.

Students will be able to identify personal actions to help protect the land.

Time

One class period.

Overview

While air and water pollution have obvious health impacts, many people fail to recognize the relationship of land issues to human health. This lesson is intended to illuminate that link. It touches briefly on three issues of land use that have an environmental (and therefore a health) impact.

The first issue is the agricultural use of land to grow food and the impact of traditional agricultural methods on the environment. The second issue is the impact of tropical rain forest destruction on

biodiversity and global warming. The third issue is planning land use for recreation and environmental protection.

This lesson begins with one or more class presentations by the student Environmental Health Detective teams who have selected land as their topic of specialization. The lesson includes class discussion and a student reading, as well as action steps and a personal pledge for action to reduce land pollution.

Teacher Materials and Preparation

HAVE:

✓ Chalk and chalkboard.
✓ Overhead projector.

COPY:

✓ **Vanishing Rain Forests** student information sheet, one for each student.
✓ **Save the Land Action Steps** worksheet, one for each student.
✓ **Pledge for Action—Land** worksheet, one for each student.

MAKE:

✓ Transparency of **Save the Land Action Steps**.

REVIEW:

✓ **Tread Lightly on the Earth** ***Teacher Background Information***.

Procedure

■ Begin the lesson with presentations by the Environmental Health Detective teams specializing in environmental issues related to land. *Note:* The following steps may vary, depending on the nature of team presentations.

As necessary, supplement team presentations with a mini-lecture about the environmental health impact of land issues, drawing on material in **Teacher Background Information**.

■ Ask students what are the major environmental issues related to land. Write their responses on the board. For each issue, ask the following questions:

- What is the problem? Describe it.

- What is the impact of this problem on people's health?
- What could our society do to reduce this problem?

■ Distribute the **Vanishing Rain Forests** student information sheet. Allow students time to read the article. Then lead a class discussion of the following questions.

- How does the destruction of tropical rain forests affect human health?
- What are the benefits (economic or others) of clearing the rain forests?
- How do choices we make as consumers in the United States relate to the destruction of the rain forests?

■ *Optional:* Following the discussion, ask students to look through their collection of newspaper clippings to identify local land-use problems. Local issues could include articles about preservation of open space, use of pesticides in agriculture, garbage-dumping or landfill issues, traffic planning, etc.

Ask students to summarize the issues for the class. Discuss the impact of the issue on the quality of life in your community.

■ Distribute the **Save the Land Action Steps** worksheet. Show students a transparency of the worksheet, and review each step.

■ Distribute the **Pledge for Action—Land** worksheet. Ask students to select one action step to commit to by filling in the contract.

Evaluation

Have students make a creative response to the following statement: Why I'm concerned about rain forests. The creative response should illustrate the relationship that rain forests have to individual human health. Students can write a poem, draw or paint a picture or create another way to demonstrate this relationship.

Read students' pledges to assess their identification of personal action steps to protect the land.

Follow-Up/ Extension

Have students write and send a letter to the World Bank protesting the funding of development projects that destroy rain forests. Each letter should list at least two reasons that rain forest destruction is harmful to human health. Each letter should encourage funding for projects promoting sustainable agriculture. (See glossary for definition.)

Send letters protesting rain forest destruction to President, The World Bank, 1818 H Street NW, Washington, DC 20433.

Show a video about an environmental land issue. Videos are available about destruction of the tropical rain forests as well as destruction of specific natural habitats in different parts of the country. Check with your district's media center.

Tread Lightly on the Earth

Teacher Background Information

It's pretty easy to see the relationship between air pollution or water pollution and human health. But the relationship of health and the third component of the natural environment—land—may not seem so obvious at first.

Of the earth's total land mass, only about 2 percent is actually lived on by humans. About 11 percent is used to grow crops, and another 25 percent is used for grazing by domestic animals. Almost one-third (30 percent) is covered by forests and woodlands. The remainder of the earth is either under permanent ice or is desert, mountaintop or steep hill.

Think about the ways we use land: We grow food, we build homes and communities, and we enjoy the outdoors through recreational activities. How we do these things can have a big impact on the environment and on our health.

Agriculture

We depend on plants for our nutrients, whether we eat them directly in the form of fruits, vegetables and grains or indirectly as meat and poultry that fed on plants. The farming methods we have adopted over the years, however, have endangered the soil that is required to grow these crops.

Soil is endangered today in two ways. First, the use of pesticides has increased the amount of crops that can be grown in the short run. However, pesticides can leave a carcinogenic residue on plants that end up in our supermarkets. Pesticides also contribute to the erosion of the soil by permitting continuous cropping rather than more traditional methods of crop rotation. Also, pesticide use makes changes in the pest species by allowing only the most hardy to survive and flourish.

Second, the soil that we need to grow food is being steadily eroded. Poor agricultural management is one reason. In addition, as acid rain and other air pollution kill plants and forests, the roots no longer hold the soil in place and it washes away.

The Worldwatch Institute has estimated that about 23 billions tons of soil are washed off the land each year. When soil is eroded, vegetation disappears and the land dries out. Then when drought occurs, famine strikes and people starve.

Growing livestock for meat is also a source of land pollution, because it requires more water use, more deforestation and more fuel consumption than other forms of agriculture. It also causes more topsoil erosion.

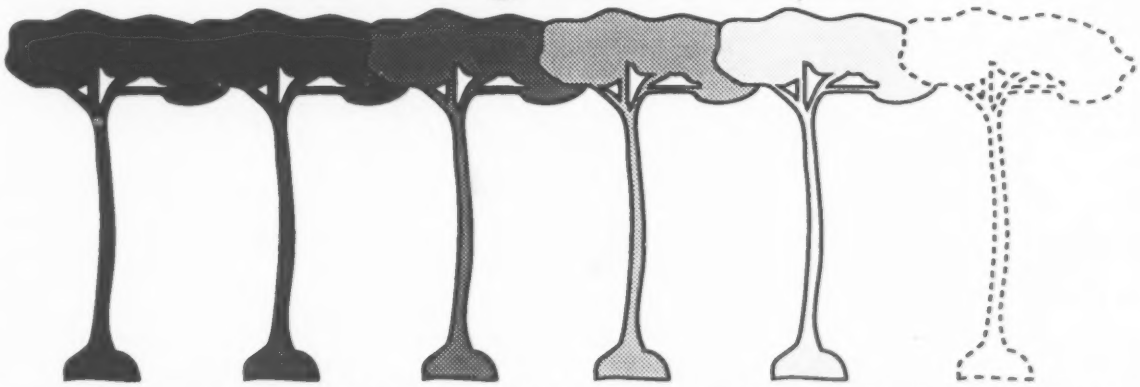
Recreation

As humans pave over the world to build more homes, factories and office buildings, less and less open space is left for hiking, camping, communing with nature and preserving wildlife. Imagine a world with no place to go to get away from it all. We would miss the opportunity to enjoy nature and its benefits—reduced stress and increased mental well-being.

The preservation of open space and the planning of communities that allow for green belts or open spaces for communal use are important local land-planning issues that impact on the health and well-being of local residents.

STUDENT

Vanishing Rain Forests



One of the most important environmental issues facing the world today is destruction of the tropical rain forests. These forests are located in the tropics, where they receive at least 100 inches of rainfall annually. Rain forests are important to humans for two reasons.

First, they are home to five to ten million kinds of plants and animals. This means they are home to half of the earth's life forms. Very few of these plants have been studied. But the rain forest plants that science has studied are the source of more than one-fourth of the medical compounds used today.

Second, tropical rain forests absorb carbon dioxide, the major greenhouse gas that causes global warming. They also help regulate rainfall.

Once, rain forests covered about five billion acres in the tropics. Today, only about half of the original rain forests remain. Rain forests are disappearing at a rate of 100 acres per minute. Every year, enough rain forest to cover the state of Kansas is lost.

Each year, millions of acres of rain forest are burned to make way for agriculture. When the forests are burned, the topsoil erodes. Then farmers clear more forest to plant new crops.

In Central America, rain forests are being cleared to make room for cattle ranching. Most of the beef raised on these ranches is exported to developed countries (like the United States) for use in fast-food restaurants.

And finally, millions of acres of tropical rain forests in Brazil and other countries are logged every year. The lumber produced includes teak, mahogany and rosewood. Most of this lumber is exported to developed nations.

STUDENT

Save the Land Action Steps

- Don't litter!
- Don't use pesticides.
- Support open-space plans, like parks, in your community.
- Support efforts to save the tropical rain forests.
- Dispose of toxic chemicals safely.
- Reduce air pollution (which also contributes to land pollution) by walking or biking or using public transportation instead of driving.
- Eat more meals without meat.
- _____
  _____
- _____
  _____

STUDENT

Pledge for Action
Land

I, _____, promise that I will _____

_____

to protect the land.

_____

Signature

_____

Date

LESSON 8

THE GREAT ENVIRONMENTAL HEALTH SCAVENGER HUNT

Objective

Students will be able to identify products they can purchase and activities they can undertake to be responsible environmental consumers.

Time

One class period.

Overview

In this lesson, the Environmental Health Detective teams present the results of the Great Environmental Health Scavenger Hunt. If you chose to have your students do the Eco-Experiments in Lesson 1, this is the point at which to look at the results of each experiment and discuss their implications.

If you are planning an Environmental Health Fair organized around the earlier team class presentations on their areas of specialization and the results of the scavenger hunt, team presentations during class can be considered a rehearsal for the fair.

Teacher Materials and Preparation

HAVE:

✓ Overhead projector.

COPY:

✓ **Becoming Green Action Steps** worksheet, one for each student.

MAKE:

✓ Transparency of **Becoming Green Action Steps**.

Procedure

■ Ask each Environmental Health Detective team to make a class presentation between five and ten minutes long to display the results of the scavenger hunt. If teams were assigned Eco-Experiments (Lesson 1), the teams should include a report on these results as part of the presentation.

When all teams have made their presentations, ask students: What do the scavenger hunt survey results tell us about the average American's level of knowledge about and commitment to the environment?

■ Tell students that the environmental movement is symbolized by the color green. *Green* citizens are environmentally conscious. Distribute the **Becoming Green Action Steps** worksheet. Show students a transparency of the worksheet as you review the steps.

Ask students for suggestions of other steps that could be added to the transparency. Ask for ideas from students about ways to share these steps with others outside of class.

Evaluation

Team presentations of the scavenger hunt should be graded on their completeness and the number of items successfully collected. If you have asked students to display their findings in some kind of exhibit, you may wish to evaluate the neatness and effectiveness of their display. Refer to **The Great Environmental Health Detective Competition *Teacher Planning Sheet*** in Lesson 1 for suggestions on a grading system.

Follow-Up/ Extension

Hold an Environmental Health Fair. Teams can display the results of their research into environmental topics and of the Great Environmental Health Scavenger Hunt. The fair could be held on a back-to-school night or an open-house night for parents. It could also be open to students during the school day. Team members should staff their displays and explain their findings to fair visitors.

STUDENT

Becoming Green Action Steps

- Look at the label. Look for products that have a recycled symbol on the box. Look for detergents that are phosphate-free. Avoid products that contain harmful ingredients—aerosol sprays with CFCs—and things packed in Styrofoam.

- Precycle—buy items with less packaging, in boxes made from recycled cardboard, in bulk quantities, in recyclable containers.

- Recycle what you can.

- Avoid products that are over-packaged. Choose the fast-food restaurants that use the least packaging. Avoid disposable items like razor blades.

- Buy energy-efficient light bulbs, cars and appliances.

- Become a smart consumer. Check out advertising claims that a product is safe for the environment.

- Conserve water.

- Dispose of hazardous chemicals properly.

- _____
  _____

- _____
  _____

- _____
  _____

LESSON 9

THINK GLOBALLY, ACT LOCALLY

Objective

Students will be able to identify ways in which they can be responsible global citizens in regard to the environment.

Time

One class period.

Overview

This lesson serves as a summary and focuses on the individual student's commitment to an environmental ethic. It deals with the facts that choosing to adopt a pro-environment lifestyle may not always be comfortable and that it is easy to become discouraged and feel that your small efforts are meaningless.

The lesson begins with class discussion of the action steps for the environment that students have pledged to take. After reading an Earth Day pledge, students write their own environmental pledge. A student reading examines some of the problems students may encounter as they deal with environmental issues.

Teacher Materials and Preparation

HAVE:

✓ Chalk and chalkboard.

COPY:

✓ **The Green Pledge** student information sheet, one for each student.

✓ **My Personal Pledge for the Environment** worksheet, one for each student.

✓ **Avoiding the Pitfalls** student information sheet, one for each student.

Procedure

■ Ask for student volunteers to share with the class some of the pro-environment actions they have identified on their various pledges. Ask how easy or difficult it has been to incorporate the actions into their lives. Write student responses on the chalkboard under two columns:

ACTION	EXPERIENCES WITH ACTION

Continue this discussion until everyone who wants to share an experience has had the opportunity to do so.

■ Tell students that you are now going to share with them the Green Pledge that was created in celebration of Earth Day 1990, an international observance to draw people's attention to the importance of saving our environment. The Green Pledge is an easy summary of the basic steps to being a good environmental citizen.

Distribute **The Green Pledge** student information sheet to each student, and read it aloud. Then have students work in small groups or with their Environmental Health Detective teams to write their own pledges. Students may want to use the pledges for action they completed in earlier lessons as a basis for these final pledges.

■ Acknowledge that it's easy to become discouraged about adopting a pro-environment lifestyle and to feel that individual efforts don't count for much. Such feelings are not uncommon. But remind students that when many people do even one simple thing, the cumulative effects can be tremendous.

Distribute the **Avoiding the Pitfalls** student information sheet, and read it together as a class. Encourage students to share their thoughts about how they will maintain their commitments to the environment in the years to come.

Evaluation

Have students review all their pledges for action and think about the actions they adopted and how satisfied they are with the changes they have made. Then students should write an essay, make a collage or draw an illustration entitled "Creating a Healthy Environment." In their presentation, they should identify the ways they intend to act as a responsible global citizen to create a healthy environment.

Follow-Up/ Extension

Begin a student-written environmental advice column in the school newspaper. Students, teachers and staff could submit their environmental concerns or questions to the column staff who respond in the column.

Conduct a school-wide environmental audit, looking for things your school could be doing to protect the environment (recycling aluminum, paper and plastic; encouraging biking/car pooling; conserving water, etc.).

The Green Pledge

I pledge to do my share in saving the planet by letting my concern for the environment shape how I:

Act: I pledge to do my utmost to recycle, conserve energy, save water, use efficient transportation and adopt a lifestyle as if every day were Earth Day.

Purchase: I pledge to buy and use only those products least harmful to the environment. Moreover, I will do business with corporations that promote global environmental responsibility.

Vote: I pledge to vote and support those candidates who demonstrate an abiding concern for the environment.

Support: I pledge to support the passage of local, state and federal laws and international treaties that protect the environment.

STUDENT

My Personal Pledge for the Environment

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature

_____

Date

Avoid the Pitfalls

by Clark W. Bullard

To be a successful activist, you must learn to avoid or outwit mind traps. Mind traps are those little sinkholes that your mind falls into when it tries to contemplate cultural or environmental problems and is boggled at their magnitude. They are reinforced by the media and our leaders because they preserve more options for those currently in power. They are also sprung by friends who have an interest in getting you to accept one of their own mind traps.

Here are some of the mind traps I've identified and my response:

Mind Trap Number One: *Someone knows what to do and is in control.*

Sorry, but "they" do not know what to do. They are not in control, and they are not doing it.

Mind Trap Number Two: *Even if I do my share, nobody else will, so why bother?*

I can't prove that you are wrong, but it's a self-fulfilling prophecy. We all must take responsibility for the world we share. The lure to do otherwise is strong. For example: One person or one factory can benefit from polluting the air, but the costs of cleaning it up are spread over all. It's like going to a restaurant with 20 people and deciding to put the whole bill on one check and split it equally. That makes it hard to avoid the temptation to order steak and lobster.

Mind Trap Number Three: *I can't take the first step unless I know the whole route.*

The only way to learn a new path is to take a few steps, make mistakes (like writing a really embarrassing letter to the editor), experiment and learn and adopt an explorer or research mentality. Recognize that your friends are making mistakes and that they need encouragement from you—especially after writing an embarrassing letter to the editor.

Mind Trap Number Four: *These are all long-term problems. Let's just ignore them and work on the short-term problems.*

A year from now they are still going to be long-term problems, and they are often easier and cheaper to deal with early on.

Mind Trap Number Five: *Disaster is coming anyway no matter what I do, so why bother?*

Disaster only occurs if everybody does nothing. We live in a diverse and pluralistic society, so when a disaster is coming a few people start making changes. Be one of those people. Don't get hung up trying to prevent disasters; just work on ways to make things better.

Mind Trap Number Six: *Don't worry, technology and the market system will take care of everything. When oil gets scarce, some new technology or new resource will be discovered and developed.*

That's like saying the hammer will build the house. Remember that the market system and technologies are just tools of our society. Technologies simply reflect our values and concerns, our resources and constraints. We are responsible for controlling our technologies.

Mind Trap Number Seven: *I can't do it all, therefore I won't do anything.*

What you *can* do is make up your mind to give a certain amount of time, money and influence. Something small enough that you can sustain the commitment. Then, as you get more efficient and productive, increase the level.

The problems that confront us are big and they are messy. But we live in the United States, a self-governing democracy. We have the freedom and the luxury to take action on the issues that concern us. We also have an overriding responsibility to make time for activism and to exercise our democratic privileges.

By avoiding the mind traps that keep others idle, we can take action and make a difference.

Excerpted with permission from "Avoid the pitfalls that line the road to effective activism," *Audubon Activist*, January-February 1988, p. 11.

GLOSSARY

Acid rain: Precipitation with high levels of sulfuric or nitric acid.

Biosphere: Living beings together with their environment.

Chlorofluorocarbons (CFCs): Chemicals used as cooling agents in refrigerators and air conditioners, as blowing agents for foam insulation, as cleaning agents. Linked to destruction of the ozone layer.

Conservation: Planned management of a natural resource to prevent exploitation, destruction or neglect.

Ecology: A branch of science concerned with the interrelationship of organisms and their environment.

Ecosystem: The complex of a community and its environment functioning as an ecological unit in nature.

Endangered: Threatened with extinction.

Environment: The complex of climate, edaphic (soil) and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival.

Extinct: No longer existing.

Fossil fuels: Materials burned to produce heat or power that are ultimately derived from living things. Coal, oil and natural gas are fossil fuels.

Global warming: See greenhouse effect below.

Greenhouse effect: Phenomenon in which greenhouse gases (carbon dioxide, methane, chlorofluorocarbons, nitrous oxide) released into the atmosphere by automobiles and industry act like the windshield of a car, heating the air below.

Habitat: Place where a plant or an animal naturally lives and grows.

Halons: Chemical used in fire suppression systems; linked to destruction of the ozone layer.

Ozone: A compound of three oxygen atoms. (1) Found in the stratosphere where it acts as a shield against the ultraviolet rays of the sun. (2) A harmful air pollutant when located in the earth's lower atmosphere, the by-product of fossil fuel burning. (3) Smog.

Pollutants: Substances that pollute the environment.

Pollution: Contamination of the environment, especially with man-made waste.

Rain forests: Broad-leafed evergreen woodlands that receive at least 100 inches of rain annually. Home to one-half the earth's life forms.

Species: A category of biological classification, made of populations potentially capable of interbreeding.

Sustainable agriculture: Agricultural practices that are economically viable, ecologically sound, socially just and humane. Such practices are generally agreed to include crop rotation, nutrient recycling, proper tillage practices, biological insect control and appropriate technology.

System: An interdependent group of items that make up a unified whole.

Toxins: Poisonous substances.

RESOURCES

Alliance for Environmental Education, Inc.
Box 1040
3421 M St. NW
Washington, DC 20007

American Society for Environmental Education
P.O. Box 800
Hanover, NH 03755

The Environmental Defense Fund
1616 P St. NW, Suite 150
Washington, DC 20036

Environmental Protection Agency
401 M St. SW
Washington, DC 20460

Greenpeace
1436 U St. NW
Washington, DC 20009

National Audubon Society
950 Third Ave.
New York, NY 10022

National Wildlife Federation
1412 16th St. NW
Washington DC 20036

The Natural Resources Defense Council
40 West 20th St.
New York, NY 10011

The Nature Conservancy
1415 N. Lynn St.
Arlington, VA 22209

Office of Environmental Education
U.S. Department of Education
Washington, DC 20202

Rainforest Action Network
301 Broadway, Suite A
San Francisco, CA 94133

Renew America
1001 Connecticut Ave. NW, Suite 1719
Washington, DC 20036

Sierra Club
730 Polk St.
San Francisco, CA 94019

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About the Author

Donna Lloyd-Kolkin, PhD, is the author of *Schoolsite Health Promotion: An Ideabook* and *The Three Age Curriculum,* which promotes health-oriented physical fitness; and coauthor (with Lisa Hunter) of *The Comprehensive School Health Sourcebook; Friends Can Be Good Medicine: A K-12 Curriculum about Relationships and Well-Being;* and *Staying Well: A Resource Package for Grades 5-8.* She codirected (with Lisa Hunter) a series of health promotion projects in California public schools under the sponsorship of the California Department of Mental Health. She has also served as editor and publisher of the *Staying Well School News,* a national newsletter about school health. She is a founding partner of Health & Education Communication Consultants, a firm whose mission is to enhance communication between the fields of health and education through the development of materials, training and technical assistance.

Reviewers of
Entering Adulthood: Creating a Healthy Environment

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ABOUT THE BOOK: *Entering Adulthood: Creating a Healthy Environment* directly addresses the crucial issue of the '90s—how we can all better protect the environment and our health. This contemporary nine-lesson curriculum helps high school students learn about the interrelationships between air, land and water, and how pollution of one component affects the rest of the environment. Then teens are given the practical tools they need to start improving the environment in their own communities through recycling, water conservation and environmental consumer awareness. Group presentations help students learn to work together to investigate environmental issues.

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- ♦ reveals what happens to the garbage we create every day—and how to cut back
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